M.T.A.C.

DESTINATION 2000:
TOMORROW'S TECHNOLOGY TODAY

THE
MONTANA TELECOMMUNICATIONS
ADVISORY COUNCIL

PRESENTS

TELECOMMUNICATIONS OF TODAY

TCI Cablevision of Montana, Inc.

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THE
MONTANA TELECOMMUNICATIONS
ADVISORY COUNCIL

PURPOSE:

To develop a plan for the State of Montana to encourage and foster the creation of a modern, affordable telecommunications infrastructure.

To coordinate the activities of interested communities and organizations that are undertaking projects for the creation of telecommunications infrastructure or for the creation of programs for economic development and the delivery of distance learning, telemedicine, or other services.

Provide technical assistance to interested communities and organizations.

Report to the Governor, the Office of Public Instructions, the Public Service Commission, and the Legislature its recommendations for policy actions to achieve the objective of the construction and utilization of a modern, state-of-the-art telecommunications infrastructure in the State of Montana.

MONTANA TELECOMMUNICATIONS ADVISORY COUNCIL
MTAC
TECHNOLOGY SUB-COMMITTEE OVERVIEW

for the Telecommunications Symposium
Bozeman, Montana
November 11-12, 1993

The information that follows is a brief overview of some of the technologies that exist today in telecommunications, and some of the uses of those technologies. The technology sub-committee knows that this information is not all inclusive. Rather, it is an attempt to give the audience at the symposium some basic information they can use while planning their telecommunications systems. It is also an attempt to promote discussion regarding the technology of today.....and the technology of tomorrow.

Members of the technology sub-committee have submitted information regarding telecommunications technology and its uses. Due to the time constraints, some of the uses of telecommunications technology are not represented in this document.

The members of this sub-committee appreciate the opportunity to share this limited resource with you. We also want to take this opportunity to thank TCI for reproducing this document. Their support and commitment to this project is appreciated.

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY IN HIGHER EDUCATION

COMPILED BY:

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TELECOMMUNICATIONS IN HIGHER EDUCATION

Compiled by: Arlene H. Parisot
Great Falls Vocational-Technical Center

MONTANA

1. Tribal College Consortium

   Formed by three tribal colleges that serve the Native American Community in Montana - Little Big Horn, Salish Kootenai, and Fort Peck Community College. Rocky Mountain College, a four-year institution, sends teacher education courses to the two-year tribal colleges via telecommunications. The tribal colleges, in turn, share courses on Native American Studies with Rocky Mountain College.

   Phone line, computer links, and videotapes to send educational courses of upper division level to students, tribal and non-tribal, hundreds of miles away.

   Expect fibre optic lines within two years

2. University of Montana Telecommunications Center

   Compressed video/METNet project in school of Business; public radio/tv operation; UM-MSU digital video link with satellite access; and extensive audio/video production facility

3. MCAT - Missoula, MT

   Public, educational, and governmental cable access

4. EDUNET

   Distance learning network that provides free bulletin board access, public domain drug education curricula for teachers and various course offerings for high school and vocational technical skills

   Computer and modem

5. MUSnet - The Montana University System Educational Network

   Dialup and fractional T1. Provided primarily by the Telecommunications Bureau of Information Services Division

   Provides high performance data communications network connecting all Montana University System campuses, the Office of the Commissioner of Higher Education, and the Information Services Division of the Montana Department of Administration

Serves postsecondary education in the State of Montana by increasing faculty/student access to educational software at considerable cost savings, BITNET access for all MUS campuses, electronic mail services among participants, electronic transmission of data to the Commissioner's Office, access to supercomputing centers and various national data bases, and improved communications capabilities to State Department of Administration computing facilities

6. MULTI-PROTOCOL NETWORK

Digital 56 KBPS circuits, TCPIP protocol, Cisco Routers. Circuits are on the State Telecommunications Network, and leased from the telecommunications industry

Provides connectivity for the university data centers to one another and to the Helena central data center. Offers an alternative Wide Area Network (WAN) to state agencies for their intercity communications needs other than the SNA network, which will carry LOCAL AREA NETWORK (LAN) traffic, as well as communications with the Helena central data center. Also provides internet access for the university units.

7. METNet

Compressed Video for two-way interactive, Compression Labs, Inc. codecs), Ascend Inverse Multiplexers operating on the State Telecommunications Network at 56KBPS through 1.544 MBPS. METNet Bulletin Board System available through dial up modems with regional dial in centers throughout the state. Satellite receive dishes and receivers (C and KU Band), with audio conveners, TVs and VCRS

Provides educational offering through telecommunication to locations that otherwise did not have educational access. Provides for sharing of educational information and curriculum data

8. HEADMASTER

Software development company based in Helena, Montana. HEADMASTER runs a distance learning service delivering courses via computer and modem with instructors based nationwide. All courses range from primary to adult. It also offers a nurse assistant training course that hospitals and nursing homes can use to train nurse assistants at their facility

Computer, modem, and printer

9. **Miles and Dawson Community Colleges**

Fully interactive fiber-optic cable, accessing a DS-3 line on cable proved by Mid-Rivers Telephone Cooperative.

Delivers the MCC RN Nurse Training Program to the communities of Glendive and Sidney and enables place-bound individuals the opportunity to receive RN training in their respective communities

10. **Miles Community College**

Participant in the METNet Compressed Video System which connects with other higher education sites in Montana and the state capitol in Helena

Delivers educational courses and programs to/from each of the participating sites and provides the opportunity for non-educational groups to utilize the network for conferencing and other informational purposes

T-i Copper Wire, compressed video

11. **Salish Kootenai College**

provides Dental Assistant training to Indian Health Service Clinics. Also, delivers National Technology and Science Alliance-at-Distance training, and AHEC telecommunications project for distance learning at tribal colleges

Satellite video, E-Mail, Compressed Video, Shared computer resources, multimedia, Bulletin Boards

12. **METNet - Bozeman, MT**

Provides two graduate level courses offered over the METNet compressed video system

Compressed video and bulletin board system (CLI and Wiltel, contractors for the METNet)

13. **KUSM - TV**

Planning statewide air expansion of signal to include transmitters in the areas of Butte, Billings, and Great Falls along with translators serving those communities not reached by these transmitters

Traditional over-the-air transmission of broadcast signals

14. TCI Cablevision and the Great Falls Vocational-Technical Center

Linkages among educational, governmental, and medical entities via a public access network by live-broadcast generated from the studio at the host site - the Great Falls Vocational-Technical Center to provide opportunities for intracity communications for informational and educational purposes

Satellite and fiber/coaxial terrestrial distribution systems

15. College of Great Falls Telecom Program

Delivers college-level course work to sixteen sites across Montana and Alberta, Canada using a combination of pre-recorded video tapes and weekly conference calls linking all sites to the main campus. Students have the opportunity to earn associate and bachelor degrees in a variety of areas and may take coursework toward two CGF Master Degrees.

Pre-recorded video tapes produced in-house by college faculty and a dedicated telephone line linking the sixteen sites to the main campus

REGIONALLY

1. Big Sky Telegraph

Provides electronic mail and a wide range of bulletin board services to education and community agencies in several states to access information and software resources of Western Montana college/University of Montana, college credit courses, and assistance from faculty members. National and international contacts are available.

2. Western Cooperative for Educational Telecommunications (WCET)

Promotes cooperation among its 15 member states and the private sector. Plans to launch a new project on "Reducing State Policy Barriers to Electronically-Delivered Higher Education Programs." This document will delineate the myriad policies of the various states and will work with education leaders to agree on standards for electronically-delivered distance programs and then securing state agency acceptance of agree-on standards and authorization of telecommunicationed degree programs. This cooperation could set the stage for expanding the number of full degrees and certificate programs available through the region via telecommunications

3. **Utah Education Network: A Statewide Higher Education/Public Schools Partnership**

No available information

Contact: Don A. Carpenter, Utah System of Higher Education
George I. Brown, Utah State Board of Education

4. **Washington State University - Extended Degree Program**

Developed to meet needs of placebound remote learners to complete a baccalaureate degree program in Social Sciences with course concentration in Criminal Justice, Political Science, Psychology, and others.

Satellite, cable TV, video tape, and correspondence

NATIONALLY

1. **Partnership for Statewide Education - Indiana**

A collaborative venture of Indiana's colleges and universities to establish a 30 hour common-core of courses - intended to be delivered through television - that are transferable among the various universities. Interinstitution faculty committees cooperatively review core general studies courses to determine equivalencies for course transfer. All seven public, plus several private institutions in Indiana are involved in the Partnership.

Indiana Higher Education Television System - live broadcast; mail communication, and pre-recorded videotapes

2. **Iowa State University in Ames**

First two way video conferencing system in the nation. The Iowa Distance Learning System allows students to see the others involved in a program. When a student is speaking, the video camera shoots the picture to all others around the state taking the course. Video sites are located throughout the state, primarily at the state's community colleges. The system currently has one channel, but eventually expects to have up to eight to allow businesses and companies to rent time on the video network, thus helping to pay for some of the costs.

3. **FrEdMail - Bonita, CA**

   Network composed of local electronic mail and bulletin board systems which operate independently during the day and transfer files between sites at night. The major goal is to motivate writing and communications skills

   Computer and modem

4. **North Carolina Central University - Smart Campus Project**

   A comprehensive information systems package, including the Universities own PBX system, to allow for electronic transmission of data throughout the campus as well as satellite downlinking for over 1,000 residence hall rooms using coaxial cable

5. **North Virginia Community College - Annandale, North Virginia**

   A 24-hour computer conferencing network connected through telephone hookups between a 3,000 student campus and users' homes

6. **Florida International University**

   Considering outsourcing the installation and management of a new cable television network to a commercial company to provide entertainment and educational programming such as language programs to its 13,000 students who live on campus

7. **Clemson University**

   Connect 70 residence halls, as well as administrative and academic building to allow for cable TV, video conferencing and local area networks for data, audio, and video transmissions.

8. **Ohio State University**

   Initiated development of an in-house cable television system to compete with prices offered by commercial service providers

9. **Communications Services Management**

   Shared Services - cost-effective alternative to user-owned telecommunications systems. CSM service provides an immediate opportunity for education to improve the technology, consolidate for efficiency, and savings without enormous costs.

10. Mississippi Fibernet 2000

World's first publicly switched interactive fiber-optic-based educational network which provides unique educational opportunities to students, teachers, and communities from four resource centers throughout Mississippi - Mississippi Authority for Educational Television, Mississippi State University, Mississippi University for Women, and Mississippi School for Math and Science as well as four public high schools

11. University of California Videoconferencing

Provides opportunities for communications among the nine campuses within the University of California system utilizing videoconferencing units and peripheral equipment as well as two-way interactive communication through compressed video

INFORMATION RESOURCE

The Electronic University, A Guide to Distance Learning Programs, published this month, October '93, by Peterson's in cooperation with National University Continuing Education Association (NUCEA)

This publication describes the affiliations with networks and consortia such as the National Technological University and National Universities Degree Consortium - to expand offerings and reach broader audiences. As adults' demands for accessible higher education opportunities mount, new education telecommunications programs and partnerships are proliferating.

As a note of interest - it is estimated that 300,000 people are currently using electronic instruction to access credit courses, with some 30,000 enrolled in degree programs.

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY IN THE FEDERAL GOVERNMENT

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TELECOMMUNICATIONS IN THE FEDERAL GOVERNMENT

TRENDS

- INCREASED USE OF DIGITAL SERVICES
- INCREASED USE OF INTEGRATED SERVICES (VOICE, DATA, VIDEO OVER SAME LINKS)
- INCREASING USE OF COMMERCIALLY AVAILABLE SOFTWARE/SERVICES
- INCREASING USE OF HIGH-SPEED NETWORK CAPABILITIES SUCH AS FRAME RELAY, ASYNCHRONOUS TRANSFER MODE (ATM) AND SONET
- INCREASED USE OF OPEN SYSTEMS PRODUCTS TO ACHIEVE VENDOR INDEPENDENCE FROM PROPRIETARY PRODUCTS
- INCREASED USE OF BULLETIN BOARDS FOR PUBLIC ACCESS TO INFORMATION (OVER 120 BULLETIN BOARDS)
- INCREASED USE OF ELECTRONIC MAIL SYSTEMS (INTER-AGENCY & INTRA-AGENCY)
- INCREASING ACCOMMODATION FOR INDIVIDUALS WITH DISABILITIES
- INCREASED USE OF DISTANCE LEARNING ACTIVITIES

HIGH PERFORMANCE COMPUTING AND COMMUNICATIONS ACT

* HOUSE SCIENCE, SPACE AND TECHNOLOGY COMMITTEE INTRODUCES H.R. 1757 (HIGH-PERFORMANCE COMPUTING AND HIGH-SPEED NETWORKING APPLICATIONS ACT OF 1993 ALSO KNOWN AS HPCC) TO AUTHORIZE APPROPRIATION OF $1.5 BILLION OVER FIVE YEARS TO EXPAND RESEARCH INTO ADVANCED NETWORKING TECHNOLOGIES, DEVELOP APPLICATIONS FOR BROADER USE OF A FUTURE HIGH-SPEED NETWORK, AND DEVELOP STANDARDS TO ENSURE NETWORK SECURITY, PRIVACY AND USER-FRIENDLY INTERFACES. WOULD INCLUDE HEALTH CARE AND ALL LEVELS OF EDUCATIONAL INSTITUTIONS AND LIBRARIES AS NETWORK USERS. FEDERAL GOVERNMENT WOULD NOT BUILD THE NATIONAL INFORMATION INFRASTRUCTURE (NII) UNDER THIS BILL, INSTEAD THE DEPLOYMENT OF THE PHYSICAL NETWORK WOULD BE THE RESPONSIBILITY OF THE PRIVATE SECTOR WHICH WOULD OWN AND MAINTAIN THE NETWORK. COMPLEMENTS EFFORTS BY THE HOUSE ENERGY AND COMMERCE COMMITTEE TO ENCOURAGE RAPID DEPLOYMENT OF HIGH-SPEED NETWORKING AT THE LOCAL TELEPHONE COMPANY LEVEL AND EASE REGULATIONS THAT MIGHT IMPEDE EFFORTS OF LOCAL TELEPHONE COMPANIES IN DESIGNING LOCAL PORTIONS OF THE NII. DIRECTOR OF THE FEDERAL OFFICE OF SCIENCE AND TECHNOLOGY POLICY WOULD BE RESPONSIBLE FOR DEVELOPING A PROGRAM TO MAKE THE NETWORK MORE USABLE BY THE AVERAGE PERSON.

KEY REQUIREMENTS OF THE PLAN INCLUDE:

NATIONAL SCIENCE FOUNDATION (NSF) WOULD BE REQUIRED TO HELP EDUCATIONAL INSTITUTIONS, LIBRARIES AND LOCAL GOVERNMENTS ESTABLISH CONNECTIONS TO INTERNET WHICH IS VIEWED AS THE FORERUNNER TO NII.

SPECIFY WHAT RESEARCH IS NEEDED TO ENSURE NETWORK

SECURITY, PRIVACY AND DEVELOPMENT OF USER INTERFACES.

FUNDS AVAILABILITY TO DEVELOP EDUCATIONAL AND HEALTH CARE APPLICATIONS TO BE USED ON THE NETWORK. POSSIBLE APPLICATIONS MIGHT BE TEACHER TRAINING AND HEALTH CARE DELIVERY SYSTEMS.

DEVELOPMENT OF PROTOTYPE LIBRARIES THAT OFFER STORAGE AND RETRIEVAL OF LARGE QUANTITIES OF ELECTRONIC INFORMATION.

SPECIFICATION OF PROJECTS TO IMPROVE ACCESS TO GOVERNMENT INFORMATION, SUCH AS PROVIDING CONNECTIONS FOR LIBRARY DEPOSITORIES TO INTERNET AND ESTABLISHING A LOCATOR SYSTEM FOR INFORMATION AVAILABLE VIA INTERNET.

THE BILL ALSO SUPPORTS THE ESTABLISHMENT OF A GIGABIT LEVEL TEST BED NETWORK TO BE USED TO DEMONSTRATE ADVANCED TECHNOLOGY.

*** INDUSTRY IS CONCERNED THAT THE FEDERAL GOVERNMENT WOULD COMPETE WITH THE PRIVATE SECTOR IN BUILDING OR OPERATING THE NII. ***

* AMENDMENTS TO BILL PROVIDE FOR ROLE OF EDUCATION DEPARTMENT TO WORK IN CONCERT WITH THE NATIONAL SCIENCE FOUNDATION ON EDUCATIONAL APPLICATIONS. OTHER AMENDMENT INCLUDE STIPULATIONS TO PROVIDE FOR THE NEEDS OF PEOPLE WITH DISABILITIES; NII FUNDING WOULD COME FROM AMOUNTS ALREADY APPROPRIATED TO PARTICIPATING AGENCIES; NSF WOULD BE RESPONSIBLE FOR ENCOURAGING LOCAL TELEPHONE COMPANIES TO PROVIDE NETWORK SERVICES IN THEIR COMMUNITIES VIA THE CONNECTIONS PROGRAM; NEED FOR COMPETITION AMONG VENDORS; USE OF SYSTEMS WHICH INDICATE COPYRIGHT PERMISSION ELECTRONICALLY AND THE USE OF COMMERCIAL PRODUCTS WHEN THEY EXIST.

* GOVERNMENT IS TO BE SETTING STANDARDS AND ENSURING INTEROPERABILITY WHILE INDUSTRY IS TO BUILD MOST OF THE STRUCTURE. A WHITE HOUSE INFORMATION INFRASTRUCTURE TASK FORCE IS TO BEGIN WORK ON THE STANDARDS NECESSARY FOR NII.

CURRENT NII PROJECTS ARE:

AN ADVANCED RESEARCH PROJECTS AGENCY (ARPA) EFFORT TO DEVELOP A PROTOTYPE ELECTRONIC COPYRIGHT MANAGEMENT SYSTEM TO STORE AND DISSEMINATE TECHNICAL REPORTS. A THREE YEAR PROJECT COSTING $12.8 MILLION TO LINK ARPA, THE LIBRARY OF CONGRESS AND FIVE MAJOR UNIVERSITIES. THE PROJECT IS EXPECTED TO PRODUCE STANDARD PROTOCOLS FOR SEARCH AND RETRIEVAL, AUTHENTICATION, ACCESS CONTROL, BIBLIOGRAPHIC RIGHTS AND PERMISSIONS MANAGEMENT, AND IMAGE COLLECTION AND STORAGE.

ARPA AND NSF PROJECT TO EXAMINE THE TECHNOLOGIES INVOLVED IN ACCESSING DIGITAL LIBRARIES. PHASE I OF THIS EFFORT IS A $6 MILLION EFFORT WHICH WILL FOCUS ON ADVANCED SOFTWARE FOR BROWSING AND SEARCHING INFORMATION IN A VARIETY OF FORMATS AS WELL AS THE CAPTURE AND SORTING OF INFORMATION IN A VARIETY OF FORMATS.

A WHITE HOUSE TASK FORCE RESEARCH OF SERVICES NECESSARY FOR THE EFFICIENT OPERATION OF NII.

NATIONAL RESEARCH AND EDUCATION NETWORK - NREN

CONSIDERED TO BE THE PRECURSOR OF NII. CONSISTS OF NSFNET AND ASSOCIATED INTERNET SERVICES. NSF IS CURRENTLY EMBARKING ON PROCUREMENT EFFORT ESTIMATED TO COST $18 MILLION DOLLARS. THE PROJECT IS AIMED AT REPLACING THE CURRENT INTERNET BACKBONE PROVIDER WITH MULTIPLE VENDORS PERFORMING SPECIFIC DISCREET SUPPORT ROLES. THESE INCLUDE:

- NETWORK ACCESS POINT MANAGERS (NAPS)
- ROUTING ARBITER SERVICES
- VERY HIGH SPEED BACKBONE NETWORK SERVICE PROVIDER
- REGIONAL NETWORKS WHICH WILL PROVIDE INTERREGIONAL CONNECTIVITY BY LINKING TO NAPS AND NETWORK SERVICE PROVIDERS

THE NAP AND ROUTING ARBITER PROVIDERS CANNOT BE THE SAME ORGANIZATION.

THE BACKBONE NETWORK IS TO BE A 155 MEGABIT/SEC NETWORK.

REGIONAL NETWORK PROVIDERS WILL BE PROVIDED FEDERAL FUNDS TO CONNECT TO A NETWORK SERVICE PROVIDER.

IT IS EXPECTED THAT INTERNET WILL BE PRIVATIZED, THUS ATTRACTING INDUSTRY TO INTERNET SERVICES.

THE NETWORK PROTOCOL WILL BE TCP/IP OR OSI OR A HYBRID USING BOTH PROTOCOLS.

FTS2000 - FEDERAL TELECOMMUNICATIONS SYSTEM 2000

10 YEAR CONTRACT TO PROVIDE TOTAL TELECOMMUNICATIONS SERVICES FOR THE FEDERAL GOVERNMENT. INCLUDES VOICE, DATA AND VIDEO SERVICES. CONTRACT EXPIRES IN 1998. THE GOVERNMENT IS BEGINNING TO DEFINE ITS TELECOMMUNICATIONS REQUIREMENTS TO REPLACE FTS2000. INPUT FROM GOVERNMENT, INDUSTRY AND CITIZENS SOLICITED.

FTS2000 IS A MANDATORY USE CONTRACT. THERE IS A WAIVER PROCESS.

PROVIDES ANALOG AND DIGITAL SERVICES. PRIMARY USE IS FOR VOICE SERVICES ALTHOUGH DATA SERVICES ARE INCREASING. FULL MOTION VIDEO SATELLITE SERVICES ARE OFFERED AS WELL AS COMPRESSED VIDEO VIA FIBER CABLE.

SERVICES ARE END TO END.

CONTRACT SERVICES PROVIDED BY AT&T AND US SPRINT.

FEDERAL GOVERNMENT APPLICATION OF NETWORK TECHNOLOGY

VOICE SERVICES - TYPICAL PERSON TO PERSON TELEPHONE CONVERSATION
AUDIO CONFERENCING
VOICE MAIL
AUTO ATTENDANT/ANSWER
INTERACTIVE VOICE RESPONSE (IVR)

DATA SERVICES - DATA TRANSMISSION WHICH IS APPLICATION SPECIFIC
FOR LEGACY DATA SYSTEMS
E-MAIL
ELECTRONIC DATA INTERCHANGE
BULLETIN BOARD SERVICES
GEOGRAPHIC INFORMATION SYSTEMS
INFORMATION EXCHANGE
OUTREACH SERVICES
LOCAL AREA NETWORKING
WIDE AREA NETWORKING
GLOBAL POSITIONING SYSTEMS

VIDEO SERVICES - TRAINING
MEETINGS (PLANNING, PROBLEM SOLVING, INFO EXCHANGE)
ANNOUNCEMENTS
GENERAL OUTREACH

MOBILE SERVICES - PORTABLE PHONES
CAR PHONES
PAGERS

WIRELESS - WIRELESS VOICE AND DATA INTERCONNECTS
(SATELLITE, RADIO, MICROWAVE)

*** EXAMPLES OF APPLICATIONS USE IN THE FEDERAL GOVERNMENT ***

VOICE SERVICES *

PERSON TO PERSON CONVERSATIONS

AUDIO CONFERENCING - TYPICALLY USED TO LINK MULTIPLE LOCATIONS FOR MEETING/DISCUSSION PURPOSES. SOMETIMES USED TO PROVIDE THE AUDIO PORTION OF VIDEO EVENTS SUCH AS MEETINGS, ASSEMBLIES OR TRAINING.

VOICE MAIL - USED FOR VOICE MESSAGE STORAGE AND RETRIEVAL. TYPICALLY USED TO PROVIDE COVERAGE FOR UNATTENDED OFFICES DUE TO HIGH INCIDENCE OF TRAVEL/MEETINGS. TYPICALLY PROVIDES 24 HOUR PER DAY COVERAGE EVERY DAY.

AUTO ATTENDANT/ANSWER - TYPICALLY USED TO RESPOND TO CALLS AUTOMATICALLY WHEN IT IS FELT THAT HUMAN INTERVENTION IS NOT NECESSARY. A FEATURE OF MOST VOICE MAIL SYSTEMS. CAN PROVIDE PRE-STORED INFORMATION TO CALLERS, CAN ALSO PROVIDE FOR DIRECTING THE FOR HUMAN INTERACTION. AN EXAMPLE IS THE INTERNAL REVENUE SERVICE TAX INFORMATION HOTLINE.

INTERACTIVE VOICE RESPONSE - SIMILAR TO AUTO ATTENDANT/ANSWER EXCEPT THE CALLER INTERACTS WITH AN AUTOMATED COMPUTER SYSTEM TO RETRIEVE AND OR UPDATE INFORMATION. TYPICAL INTERACTION OCCURS USING A TELEPHONE KEYPAD OR/AND PROVIDING VOICE RESPONSES TO PROMPTS FROM THE AUTOMATED SYSTEM. FOR EXAMPLE, CHECKING ON THE STATUS OF A LOAN ACCOUNT BY A CLIENT OF A FEDERAL AGENCY OR COMMERCIAL INSTITUTION PROVIDING LOAN SERVICES.

TELECOMMUNICATIONS AT STATE LEVELS (U.S.)

STATE TRENDS ARE SIMILAR TO THOSE OF THE FEDERAL GOVERNMENT

THE STATE OF NORTH CAROLINA IS INVESTING $160 MILLION IN DEPLOYING STATEWIDE ASYNCHRONOUS TRANSFER MODE (ATM) NETWORK TO PROVIDE EXPANDED SERVICES. THIS NETWORK WILL LINK OVER 3,400 LOCATIONS AND WILL BE USED TO REPLACE THREE EXISTING NETWORKS: A 50 SITE MICROWAVE NETWORK, THE STATE SYSTEMS NETWORK ARCHITECTURE (SNA) NETWORK AND ITS WIDE AREA LAN NETWORK. THE NETWORK WILL SUPPORT STATE AUTOMATED SYSTEMS FOR ADMINISTRATION, A VIDEO-BASED CRIMINAL AND PAROLE HEARINGS SYSTEM, REMOTE MEDICAL IMAGING, LAN INTERCONNECTIONS, AND SCHOOL LOCATIONS (PRIMARY AND SECONDARY). THE STATE CURRENTLY PROVIDES 110 HOURS OF INTERACTIVE PROGRAMMING PER WEEK FOR SCHOOLS. WHILE NORTH CAROLINA OFFICIALS WILL NOT PROVIDE EXPECTED COST SAVINGS AT THIS TIME THEY EXPECT IT WILL BE SUBSTANTIAL.

TRENDS AROUND THE WORLD

THESE TRENDS ARE SIMILAR TO THE OTHER TRENDS DESCRIBED. THIRD WORLD COUNTRIES ARE LAGGING BEHIND THE REST OF THE WORLD. THE EUROPEAN AND ASIAN COMMUNITIES ARE TAKING ADVANTAGE OF THE TECHNOLOGIES TO PROMOTE PUBLIC SERVICES AND ECONOMIC GROWTH. THE FORMER STATES OF THE RUSSIAN REPUBLIC ARE ADOPTING TELECOMMUNICATIONS TECHNOLOGY TO AID IN A MORE TIMELY PROGRESSION TO STABLE GOVERNMENTS THROUGH IMPROVED AND TIMELY COMMUNICATIONS BETWEEN THEIR RESPECTIVE GOVERNING INSTITUTIONS.

CHINA IS ENHANCING IT'S POSITION IN THE WORLD MARKET THROUGH EXPANDING THE USE OF FIBER OPTICS TO EXPAND THE TELECOMMUNICATIONS BANDWIDTH TO IT'S MAJOR MANUFACTURING AND TRADE CENTERS. THE GROWTH IN TELECOMMUNICATIONS TRAFFIC IN CHINA HAS BEEN PROJECTED AT 35% PER YEAR FOR THE NEXT SEVERAL YEARS.

EXAMPLES OF APPLICATIONS USE OF TELECOMMUNICATIONS TECHNOLOGY

LAW ENFORCEMENT

Federal Bureau of Investigation (FBI) use of Geographic Information Systems (GIS) has aided in the identification and apprehension of serial criminals including arsonists, killers and rapists. Other law enforcement agencies at state and local levels are applying same techniques and in some instances are being assisted in their efforts by the FBI. The information used can be entered remotely and processed at a central location or entered and processed between remote locations.

FBI plans to provide enhanced fingerprint identification capabilities to law enforcement agencies on a global scale will be coming in the future with automatic scanning of fingerprints and online searches providing immediate input and retrieval capabilities.

The Immigration and Naturalization Service (INS) is testing hand and fingerprint scanning kiosks at airport ports of entry which will automatically scan and store the handprint information to process the storage and retrieval of traveler identification of frequent business travelers to minimize delays in clearing customs.

There is an increasing use of portable terminals/computers in police patrol cars to provide more timely access to information needed by law enforcement officers in the performance of their duties.

NATURAL RESOURCES

Geographic Information Systems (GIS) are being used to map locations of or potential locations of natural resources such as minerals, timber, water, gas & oil, and wildlife. These systems are being used by Federal, state and local governments, commercial organizations and researchers in the fields of resource management, exploration and environmental activities.

PATENT PROCESSING

The U.S. Patent Office has provided the capability for patent file searches online at it's Washington D.C. location. There is no charge for the service and public access is provided. Plans are underway to provide this access via INTERNET in the not too distant future. This will provide more timely search capability through interfaces with Universities and research organizations. The searches will include U.S. and foreign

patents. The Patent Office is installing T-1 links to Internet to provide access to it's online information to patent examiners, government agencies and other public users. The information will come from the depository libraries comprised of 74 public libraries in the nation.

ELECTRONIC COMMERCE - ELECTRONIC DATA INTERCHANGE

Based on the philosophy of Electronic Data Interchange (EDI) this provides the basis of "paperless" transactions with broad application within and between commercial and government organizations. Applications include purchasing systems complete from purchase order creation to payment approval and distribution with all actions occurring via electronic links. Another application in the Federal government is loan application processing through certification and loan approval using electronic media. EDI applications significantly reduce the timeframes required for document delivery and processing with transaction delays minimized due to electronic transfers occurring in timely fashion. Transaction activity provides for immediate storage and retrieval of documents for processing and historical reference. Federal agencies currently using EDI capabilities are: Department of Defense, Environmental Protection Agency (EPA), Department of Housing and Urban Development (HUD) and the Veterans Administration. VA's application deals with payments to suppliers, loan processing (home and student), health care claims and general information exchange between VA facilities.

COMMERCIAL DELIVERY TRACKING - UNITED PARCEL SERVICE, INC.

UNITED PARCEL SERVICE, INC (UPS) has implemented one of the world's largest wireless data networks to provide up to the minute information package information. The system is deployed in 50,00 UPS vehicles and completes more than a half million cellular telephone calls per day to track delivery information. Each call lasts an average of 12 seconds. The system is called TotalTrack and keeps constant track of the daily volume of 1.3 million packages in transit in the UPS fleet. This application is suited to short message traffic and is not intended for long transmission intervals. Bandwidth used is 1,200 bits per second and up.

LEGAL

Online services available to U.S. government attorneys provide immediate information concerning the status and results of court rulings. Used to assist in the preparation of cases.

TRAINING AND EDUCATION

Distance learning activities which can be accomplished through a variety of technology applications which can involve

broadcast quality video transmissions, compressed video transmission through terrestrial cable or a combination of satellite and wire/other wireless technologies, to a simple network interface consisting of a remote personal computer connected via a dial up telephone link to another personal computer with the instructor controlling the computer activities and providing instruction through another link via telephone to provide the audio interface.

MEDICAL

A variety of medical uses of telecommunications technologies exists today from the processing of medical service claims through payment of these claims to realtime medical support services in terms of remote EKGs, remote diagnostics to online diagnostic services available to medical practitioners, mobile/remote services available to emergency medical personnel for immediate assessment of patient condition to provide for timely medical support services.

INFORMATION DISTRIBUTION/RETRIEVAL

A broad topic which probably provides the most useful information to the general public. This encompasses the application of existing technology in it's broadest sense. It deals with information distribution (storage/retrieval) using a telephone and/or personal computers (home-based or in use by business).

Information distribution/retrieval can be accomplished by means of a telephone connected to one or more computer systems.

Examples of such uses are:

Autoattendant systems used by US WEST and AT&T which a caller accesses via a toll-free number. A voice menu is presented to the caller and pre-stored information is provided by the use of the telephone touchpad to select information or the caller has the option to get a human attendant for information not offered in the pre-stored list. If the call is placed from a rotary or pulse telephone some of these systems provide access to a human attendant. Quite a number of large commercial establishments use this technology.

Voice mail systems are another mode of information storage/retrieval. A caller can leave a message for an individual when the called party is not available. This provides an accurate means to leave a message and the called party can check messages at any time of the day.

Interactive Voice Response systems are in use by financial organizations to provide a means for a customer

to check the status of accounts. Typically these combine the features of autoattendant systems and use touch pad tones and computer technology which recognizes the voice of an individual. Credit agencies even use autodial technology which will dial the phone of a credit customer and engage in an interactive dialogue with the called party to update the status of the account with the customer's voice response (or lack of response).

Electronic mail (E-MAIL) systems using computer links to send and receive text messages. Most E-MAIL systems provide a means to "attach" other computer generated documents such as correspondence, charts, graphs and images. This also provides a way to send/retrieve messages without relying on voice messages or playing "telephone tag". Among other features, an individual can determine if the recipient of the E-mail has viewed the mail message. Has widespread use in the Federal government universities and large corporations.

Bulletin boards are extremely popular with a large segment of the population for storing/retrieving a wide variety of information. This includes computer software in addition to information of use to a general population of bulletin board users or information specific to a group of users. There are over 120 bulletin boards available to the general public provided by various Federal government agencies. Some are even accessible via toll-free telephone numbers to eliminate long distance telephone charges to users accessing the bulletin board systems.

Online services provide a means for an individual to subscribe to a multitude of services available via a computer telecommunications link. Such services include: airlines schedule information; airline flight booking; rental car reservations; investment information/transactions, educational information, E-MAIL, access to directories of services, supplies/suppliers, market research data and so forth. Most of these services are available for a fee but there are some services provided at no cost other than the cost of the telephone call.

This has been a rather brief list of capabilities available via telecommunications technology.

Some of the examples cited which are used by the Federal government can be applied to other uses in terms of the technology that exists today. They have been presented for information purposes. A telecommunications user may view these as examples of capabilities which can be of benefit to them in other applications. These concepts can be adapted to state and local governmental organizations, other public institutions, businesses and be of interest to the general public.

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY

TELEPHONY OVERVIEW

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TELEPHONY OVERVIEW

Today's telephone network is a complex web of power, switching, transmission, and "loop" cable and equipment, which allows people to interact between two or more locations. The prevalent telephone providers in Montana are US WEST Communications, PTI, and 25 independents and co-ops which form the Montana Telephone Association (MTA).

In Montana, US WEST currently owns and operates 132 wire centers (often referred to as "central offices"). PTI and the MTA members together own 140 wire centers. There is a possible transfer of 60 wire centers from US WEST to six MTA members, if the PSC and FCC give approval.

DATABASES/SYSTEMS

US WEST has multiple databases in several different locations, and some of these databases store partially redundant information. Some examples of database fields include: customers' names, physical addresses, mailing addresses, associated cable pairs, associated features, associated long distance carrier, etc.

US WEST also has a wide variety of operational support systems (OSS), large computers used to monitor and provision the network. These large and expensive computers and applications are in a constant state of evolution to improve efficiency, provide new service, and interact with or replace the other systems.

CABLE/MEDIUM

In the "loop" (central office to the home) the most prevalent type of medium used by the phone companies consist of color-coded twisted copper pairs. Some of the larger "feeder" cables can contain as many as 4,000 pairs of copper, each having the capacity to carry one two-way phone conversation. "Carrier" systems were invented by Bell Labs to multiplex as many as 96 customers over three or five T1 spans, which utilize two copper pairs (one for transmit and one for receive) to multiplex 24 conversations. Today, more and more fiber optic cable is being plowed into these feeder routes to alleviate noise and other network troubles and carry more traffic.

The "inter-office" (central office to central office) transmission mainly utilizes fiber optic or microwave radio transmission to haul thousands of conversations at one time. Where geography permits, fiber optic cable is the medium of choice, and it allows one to change out the electronics on each end to obtain more capacity without having to replace the fiber medium.

Co-axial cable is sometimes used in certain types of network equipment, and many companies are planning to use co-az in the loop for their new broadband networks. Co-ax is not a big part of today's telephone network.

SWITCHES

There are still a few more than 50 electro-mechanical switches left in Montana's network. These switches have been a reliable source of phone switching for numerous years, but they are outdated by today's newer digital electronic switches, which offer enhanced custom-calling features (such as call-waiting, call-forwarding, three-way calling, etc. US WEST also has two analog electronic switches, one of which is planned for replacement in 1994.

US WEST made an agreement with the PSC to have all electro-mechanical switches upgraded to digital technology by the end of 1995. If the 60 exchanges are sold to the six MTA members, the MTA members have agreed to the end of 1995 replacement schedule.

Until now, signaling (touchtone signals, switch-switch communications, etc.) was carried over the same circuits which are used for voice communications. A new standard, Common Channel Signaling/Signaling System Seven (CCS/SS7), allows for signaling to be done on an overlay network. This overlay network consists of digital communications via packet switches called Signal Transfer Points (STP). Not only does the new SS7 standard allow improved call set-up efficiencies, it cuts down on call fraud and opens up the possibility of CLASS services (calling number delivery being one example).

There is a new variety of switches, called data or multi-fabric switches, which were designed to switch data traffic. These switches come in a variety of types and speeds, and they add value by eliminating the need for numerous, expensive point-to-point/dedicated circuits. Frame Relay (FR) or "fast-packet' switches will operate at 56Kb or 1.54 Mb speeds and are used to interconnect LANs. Switched Multi-megabit Data Service (SMDS) switches operate at even higher speeds, and Asynchronous Transfer Mode (ATM) switches are expected to be the panacea of multi-media multi-bandwidth switching needs.

TRANSPORT

As mentioned earlier, the medium of choice today is fiber optics. With today's high-quality glass cable production, service providers can currently transmit more than 2.4 Gigabits/second over two glass fibers (one transmit and one receive). This is the equivalent of 16,128 voice conversations. There is a fiber optic system in Japan which is humming along at 10 Gb/second.

With evolving Synchronous Optical Network (SONET) and Broadband Integrated Services Digital Network (B-ISDN) standards, service providers will be better able to operate, administer, maintain, and provision (OAM&P) their networks. SONET and B-ISDN will also provide a myriad of new multi-media services.

INTERCONNECT

The largest local exchange carrier (LEC) in Montana is US WEST Communications. US WEST inter-connects with other local exchange carriers (the MTA members) to create an intra-LATA network. LATA stands for Local Access Transport Area, and LATAs were created at the break-up of AT&T to create "long-distance" territories. Montana consists of two LATAs (the western LATA includes Great Falls, Missoula, Helena, and Butte and the eastern LATA includes Bozeman and Billings).

To go from one LATA to another, one must pay an inter-exchange carrier (IC) to transport the call. Examples of ICs are MCI, AT&T, and Spring.

The LECs also inter-connect with cellular and other mobile phone providers to create a virtually seamless network. The LECs also provide interconnect/trunking links to private networks like large business and government agencies.

CAPABILITIES/FEATURES/APPLICATIONS

The telephony network was built to provide dial-tone and voice conversations. It evolved to provide "touchtone", call waiting, three-way calling, call forwarding, etc..

The invention of the computer (and the evolution to personal computers on everyday desktop) mandated a means to provide data transfers between computers. This was done with "private lines" which consisted of dedicated sub-rate, 64Kb, or 1.54Mb links between two points. If a third location was added, more private links were needed.

The invention of modems allowed people to "dial-up" the phone network from personal computers and transfer data between computers. At first, with an all copper network, modem speeds of 1200 to 2400 baud could be achieved. With the deployment of digital switches and fiber optic transmission, one might be able to achieve 14.4Kbaud transmission.

Digital switches brought ISDN and other digital features, which allowed transmission of video conferencing, calling number delivery, and simultaneous voice/data/signaling transfer.

Enhanced services such as voice messaging and facsimile storage and transfer allowed other providers to "connect" to the telephone network and provide these "enhanced" services.

Until recently, the RBOCs were forbidden from providing information services like time of day, weather, and any other information which one may want to "dial-up".

The deployment of fiber optics and the "loosening" of regulations may someday allow the telephony provider the opportunity to offer

cable services along with a variety of other information/entertainment services. Currently the RBOC's cannot offer cable services within their local monopoly area, but they can offer cable and telephony services outside of this area.

Image transfer, video-conferencing, and other interactive services are available today in some locations at relatively high costs. With the continued deployment of fiber optics, improved/less expensive codecs, and broadband switches, these services will see expanded use.

USERS

Customers consist of residents with Plain Old Telephone Service (POTS), small business with POTS/fax/low speed data lines, large business (including financial and insurance companies) with hi-cap 1.5Mb/45Mb/video and centrex (Centrex makes the service appear as a private network) services, ICs and LECs with interconnect needs, schools and governments with data/interconnect services, healthcare providers with data transfer/video-conference needs, and tele-marketers and airlines with automatic call distribution (ACD) needs.

FUTURE

The future of the "information networking" market will be very exciting. It appears that the ability to offer multi-media services and increased competition (as seen in the recent mergers of AT&T and McCaw Cellular, U S WEST and Time Warner, and Bell Atlantic and TCI) will lead to a more rapid delivery of new information services.

Continued deployment of fiber optic cable and digital switches will not only improve the service of the network, but it will allow an easier transition to the broadband infrastructure of the future. Data switches will be deployed to meet the demand of switched data services between now and the future broadband and Asynchronous Transfer Mode (and B-ISDN) network.

In the mean time, more and more users will utilize modems to access the existing network to transfer data between computers. Through technical/telephony training, school boards and administrators will utilize more and more telecommunications in the schools to keep teachers in touch with parents and to "dial-up" information services via Internet and other networks.

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY

STATE OF MONTANA USAGE

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State of Montana
State Telecommunications Network

Overview and Trends[1]

OVERVIEW

The State Telecommunications Network (STN) is a private line network capable of providing voice, data and video communications to agencies of government throughout the State. The STN currently serves state agencies, education, local government and law enforcement. The STN is built on leased facilities from telecommunications companies in Montana and a State owned microwave between Helena and Bozeman. This network currently supports telephone communications between 19 telephone switches as well as data communications between government agencies located in all 56 county seats. Further, the STN now manages two-way, interactive video communications between four cities. It also supports two-way radio communications and FM radio broadcasts (KUFM) from Missoula to Helena and Great Falls.

The State Telecommunications Network is managed by the Department of Administration's Information Services Division (ISD).

DATA NETWORKING

Data Networking is a critical, and complex, piece of the state's overall communications strategy. One of the fastest growing communications areas, computers are communicating with one another more and more, and agencies are more reliant on this fact. This section deals with initiatives in data communications throughout state government in the following manner: Wide Area Networks; Local Area Networks; and Bulletin Board Systems.

Wide Area Networks. Most of the State's computers are connected across the State through the dedicated, leased facilities of the State Telecommunications Network. The STN is most appropriate for high speed, high reliability, secure, or high use situations. Operating over the STN are two Wide Area Networks (WANs): The SNA network (IBM's Systems Network Architecture), used by most agencies for connection to the state's IBM mainframe, and; Montana's DECNET, used to interconnect DEC computers owned by the university units and certain state agencies. These network are managed by ISD to serve state agencies and other government units within the State, and to provide connections with selected out of State organizations. Additionally, the Lottery manages a separate network for the sole purpose of operating its on-line lottery.

The primary data network for the state is the SNA network. It links about 4000 devices at 200 sites to the central computer in Helena. The SNA network also interconnects to the Department of Revenue AS-400, the Department of Corrections AS-400 and to the Justice computer at the armory. The network has high-speed concentrators to collect traffic from throughout the state (about 5,000 circuit miles) in Kalispell, Missoula, Great Falls,

[1] Extracted from "*Information & Telecommunication Technology in Montana State Government - A Report of Agency Information Systems Plans for Fiscal Years 1994-95.*"

Billings and Helena. This network is about 15 years old and provides highly reliable, predictable and manageable service to the State. The network is designed to be highly efficient and thus able to operate on cost effective, relatively low-speed, shared data circuits throughout the State. For example, one circuit might serve as many as 15 sites in five cities. This network continues to add over 500 terminals per year, but suffers from its inability to connect agency LANs together across the State in a fast and efficient manner.

The second data network is routed and managed on separate circuits from the SNA network. It is called DECNET, but is referred to by the university units as MUSENET (Montana University System Educational Network). It is about four years old and connects many Department of Transportation offices as well as the six university units. Expansion is predicted to other colleges as well as secondary education sites and possibly other State agencies. The Decnet handles more types of traffic and serves more varied functions than the SNA network. It is therefore more complex, higher cost and has been less reliable than the SNA network (due to its relative youth and limited management compared to the older, larger and established SNA network).

Local Area Networks. LANS really began for the state in about 1987 and have expanded so rapidly that today virtually all the State's computers are attached to a LAN. They are primarily used to share computer disk, computer software, printers and other resources among many personal computer users. They also collect statewide traffic from a number of computers to be funnelled onto the Wide Area Networks.

In 1987 the Department of Administration established the IEEE 802.5 token ring standard for LAN communications within State government. This standard allows a wide variety of hardware and software from many vendors to run on the LANS. Outside of the historically "Decnet" agencies (the universities, DOT and DNRC), this standard is now virtually universal in State government. From 1987 through 1992 the State added about 1000 microcomputers a year to LANs, and it appears that this pace will continue in the during the next five years.

ISD manages LANs as shared communication facilities for all agencies located together in an area. For example, ISD manages one LAN in each county courthouse that is shared between State agencies like SRS, Revenue, and Justice as well as county agencies in many cases. This LAN provides each agency shared access to the State SNA network and mainframe, making it technically possible to automate and coordinate their local functions.

In FY92, ISD installed a fiber optic network to 11 buildings on the Helena complex. Although this network is initially intended for only LAN traffic, it will eventually serve voice and video needs in these buildings as well. In FY93 ISD will implement LAN traffic on up to seven of these buildings. Completion of this capitol complex backbone network during 1994 and 1995 will provide capitol complex agencies with a single high speed LAN to meet future LAN connectivity needs for at least 10 years.

Bulletin Board Systems. Bulletin Board Systems. Bulletin Board Systems (BBS) are computers (usually microcomputers) that allow people on other computers to use dialup telephone facilities to access them.

The Office of Public Instruction operates the largest BBS system in the State, the METNET BBS. It has 15 regional sites that provide educational services to school districts, libraries and other people and organizations involved in secondary and higher education in the State. They also provide overnight links for electronic mail with the Internet national and international research and education network.

ISD offers a central BBS for all State agencies to provide information to the public in the State of Montana. It provides a single 800 number throughout the State as well as a Helena number. Currently, it provides a wide variety of information from state agencies. Some examples are the road and weather report, legislative information, agricultural information, and American Disabilities Act (ADA) information.

VOICE NETWORKING

The Department of Administration provides agencies telephone service at all sites throughout the State. ISD, in cooperation with the University System, manages telephone switches at 19 sites throughout the State, including four in Helena and six at the University units. In addition, ISD procures and contracts maintenance for telephone key systems for all other agencies statewide.

ISD connects these 19 telephone switches through the facilities of the STN, allowing the State to carry most of its internal traffic on this network, avoiding long distance charges. ISD also maintains a series of contracts with telephone service providers for operator assisted calls, pay phones, and discounted, volume rates on long distance calls. Voice traffic comprises 90% of the use of the STN.

The State provides local and long distance calling services for students living in the dormitories on five of the university campus's. This program benefits the State by increasing the utilization on its volume contracts and facilities during the evenings and weekends (times when they are least used), thus lowering the per unit cost to all agencies.

Local and Long Distance Circuits and Contracts. The STN provides local and long distance calling capabilities for agencies throughout the State. Competitive contracts for digital and analog circuits, intraLATA toll discount, interstate calling and credit card utilization have been signed with private sector providers.

The State's telephone switching systems are connected together by analog trunks or digital T-1 circuits. In addition, each of these switches is connected to U.S. West or the local telephone company for local telephone calls. These dedicated circuits, called local office trunks, vary in number based on utilization patterns.

ISD maintains a contract, currently with AT&T, for some intrastate and all interstate and international telephone calls. This provides the State with substantial long distance savings on calls made from all State facilities, or with a State credit card. In addition, the State uses tariffed access services, and has a contracts with U.S. West for discounts on intraLATA calls within the State. These contracts, coupled with the capabilities of the STN, result in rates for long distance calling that, in FY93, are 35% below AT&T's daytime rates, 40% below AT&T's evening rates, and 60% below AT&T's night and weekend rates.

Telephone Systems. The state began the active management of its own telephone systems is 1982 when it acquired it's first Private Branch Exchange (PBX) at Western Montana College. Since that time, 18 additional PBX's have been purchased at major locations throughout Montana which manage a total of over 15,000 state telephones. These PBX's primarily provide on-campus and local calling, and access to the STN for long distance calling. Additionally, these systems manage fax communications and dial-in data calling, and provide voice mail features, access for telecommunications devices for the deaf, and operator services. The ownership and management of these PBX's has provided substantial savings over alternative lease arrangements.

With the cooperation of the University System, these PBX's have grow to be the critical hubs or "nodes" of the STN. Not only do they manage calling from and to the phones at each location, they manage the routing of calls across the STN. This is done in such a fashion as to maximize the capacity and costs for dedicated inter-city trunks and other long distance programs. The management of these "network nodes" is provided by ISD through contracts with private sector telecommunications companies.

ISD and the University System have maintained these PBX's with common software and hardware releases as improvements have been required. The manufacturer's, Northern Telecom, Inc., upgrade philosophy does not require wholesale replacement of the basic architecture as upgrades are needed. Through this philosophy the state is staying current with technological developments in an extremely economical fashion.

These PBX's not only provide for telephone call management but also manage

certain aspects of ISD's Wide Area Networks. SNA and DECNET data circuits are partially managed by these systems on critical routes. Additionally, video images now moving between the METNET Two-Way Video Systems (see Two-Way Interactive Video Systems discussion) are also controlled and managed through these systems. Through their sophistication the state can continue to achieve savings over other alternatives, and to provide for better management of all network facilities.

VIDEO NETWORKING

Two-Way Interactive Video Systems. House Bill 30 of the 1991 Legislative Session established the Montana Educational Telecommunications Network (METNET). METNET, through the Office of Public Instruction, the University System, and the Department of Administration, calls for the coordination of the deployment of telecommunications technologies to provide for distance learning opportunities in Montana. A key piece of METNET technology is the creation of two-way interactive video systems at distant cities and towns throughout the state.

In 1992, METNET and the University System installed two-way interactive video systems at four sites: Helena, Bozeman, Missoula, and Billings. The video systems utilize the STN to carry the video image and audio signal between locations. The system will be used primarily for the delivery of classroom instruction and in-service training for teachers. As the infrastructure is deployed to geographically distant parts of the State, it has the potential to be of significant benefit to State government for inter-active video conferences, dramatically reducing travel costs.

In FY 1993, additional equipment will be installed in Miles City and Kalispell, at the respective community colleges. The addition of the Miles City location will allow the METNET Video Network to inter-connect with the Mid Rivers Fiber Optic based video network already in place in Eastern Montana. This will allow the METNET Video Network to extend to Glendive, and Sidney, and to other locations eventually served by the Mid Rivers system.

Satellite Capabilities. Primarily for education, but suitable for other agency use, satellite communications offer one-way receive access to distant instructors as well as access to a plethora of existing programming. As one of its first goals, METNET has actively pursued the deployment of satellite receive technology at various K-12 schools and university units. The METNET project has established a cooperative purchase term contract for C and Ku band satellite receive dishes for schools in the State. The five year goal is to locate as many satellite receive dishes at the State's schools as there are interested participants. To date, there are over 250 satellite systems installed at K-12 schools and University units.

The Commissioners Office of Higher Education Ku band uplink/transmitter, located at MSU in Bozeman, provides an origination point for in-state satellite video programming. This technology is compatible with the satellite receive dishes that have been installed at schools throughout the State. The uplink/transmitter equipment provides an inter-connection to the METNET Video Network, allowing any user the ability to send programming over Ku band Satellite to any Ku band satellite receive dish in the State. The Ku band satellite uplink/transmitter is a critical element of a strategy to originate more in-state programming and educational courses over the next five years. In 1992 the satellite uplink/transmitter was used to deliver the Montana Water Course statewide to K-12 schools, and by several State Agencies to deliver statewide policy and training programs.

PUBLIC SAFETY COMMUNICATIONS

Public safety communications activities, including 9-1-1 systems and land mobile radio systems, continue to expand throughout the state. The following discussions describe the major activities underway in both of these important public safety areas.

9-1-1 Emergency Telephone Service. The Statewide 9-1-1 Emergency Telephone System Program has been in place now since 1987, and the account generates on the average just under $1.1 million per fiscal year.

These funds are used for the planning, implementation and operation of emergency telephone systems using 9-1-1. By the end of 1993 there will be forty-four, State-approved, 9-1-1 emergency telephone systems available for public use throughout the state. Approximately ninety percent of the state's population in forty-one of the state's fifty-six counties are served by these systems. Twelve additional areas are actively planning for 9-1-1 implementation.

The public's perception of 9-1-1 emergency telephone service is largely influenced by the proliferation of popular television programs portraying the delivery of emergency services. However, these programs typically spotlight systems which are more sophisticated than most of the emergency telephone systems in Montana. Most of the state's systems provide only minimum service, where emergency callers can dial 9-1-1, although there are a few systems which automatically display the telephone number of the calling party. Furthermore, some systems do not have dedicated 9-1-1 circuits, which means 9-1-1 callers compete with other telephone users for time on the public switched telephone network, and could have an emergency call blocked. Implementing enhanced features such as Automatic Number Identification (ANI) and eliminating call blocking potential through the public network are priorities for many 9-1-1 systems in Montana.

Land-Mobile Radio Communications. As the Federal Communications Commission liaison for all public safety communications frequency assignments in Montana, the Department of Administration is involved in virtually all frequency coordination issues with state and local agencies. Although radio frequency congestion and frequency licensing demands remain a problem, improvements have been made in frequency management through the implementation of technical assistance programs and formal frequency coordination agreements, and by the automation of frequency distribution data bases. Automation of the Department's frequency spectrum management system, which will be completed during the current fiscal year, will also enhance the Department's capability to support public safety communications users.

A major undertaking during the current biennium was completion and submission of a frequency plan to the Federal Communications Commission (FCC) for the newly available 800 MHz frequency spectrum. This plan, required to be submitted by all 50 states, provides agreement of all major participants in Montana, including equipment vendors and state and local government representatives, on the management of Montana's frequency spectrum on a going forward basis.

Mutual aid communications, using frequencies licensed to the State, have proven to be a keystone for effective interagency cooperation during an emergency response. Plans, policies and procedures have been developed and widely disseminated. These materials are now used as a basis for public safety communications training throughout the state.

Today, the Department of Transportation and the Department of Justice operate separate major land mobile radio systems, and several other agencies of the state utilize the technology to a lesser extent. These systems, along with most local government systems, are high band systems and will serve the agency's needs for the foreseeable future. However, new technologies using trunking techniques and different spectrum (800 Megahertz) offer the potential for the creation of a unified system which provides improved coverage, efficiencies in spectrum management, lower maintenance costs, and a longer more stable technological future.

INITIATIVES AND EMERGING TECHNOLOGIES

Distance Learning Networks. Through METNET, Montanans will be able to teach, learn, and share educational resources and opportunities, ideally from anywhere in the state. Virtually all types of telecommunication technologies and resources are used in METNET, including computers and data networks, satellite dishes, interactive video networks, public telephone networks, and fiber optics.

METNET has been a highly visible and successful program for the State of Montana.

Over 200 satellite dishes, 330 modems, and 15 bulletin board systems have been installed in 156 K-12 schools and 6 University units. The initial response was slow, but as participation and enthusiasm increased, so has the demand. METNET in its various forms offers benefits to the State by addressing problems of rurality, size, subject area expertise in education, and the broadening and strengthening of community and entrepreneurial spirit.

A personal computer equipped with a modem is capable of two-way, interactive communication and of accessing myriad national data bases and bulletin boards. Montana educators are using computer-based data links creatively to provide learning opportunities never before available in Montana. At least four educational network applications for Personal Computers are now in use in Montana using the existing telephone infrastructure (Big Sky Telegraph, METNET BBS, Goliath, and the Young Scholars Program).

The METNET BBS provides teachers access to other teachers for course development, training, and the sharing of ideas. Students can access other students, and all users access a greater range of national and international data bases, computer bulletin boards, and subject matter expertise. More in-state classes and programs are contemplated over the next five years.

Voice Response Systems. Voice response systems allow callers to reach host computers to access databases and/or carry out transactions, using the keypad of a touch tone phone. Pre-recorded voice or text-to-speech is used to communicate with the caller, providing instructions, confirming the touch-tone entries and translating data from the computer into speech. It's called voice response because the system responds to touch-tone commands with voice responses. Applications of voice response can be used by many State agencies, such as:

Social and Rehabilitation Services
- o Child Support Payments Tracking

Department of Labor and Industry
- o Unemployment Verification
- o Job Announcements

Department of Justice
- o Professional License Verification/Certification
- o Drivers License Verification
- o Motor Vehicle Registration

Department of Revenue
- o Tax Return Assistance

Cellular/Wireless Systems. Cellular telephone use by state agencies is growing and quickly becoming an effective communications tool as agency personnel are in a travel status. The number of State subscribers has increased by approximately 50% over the past year. Cellular service is being used to provide mission-critical communications for the Departments of Agriculture, State Lands, FW&P, Transportation, and several units of the University System. It is found to be particularly useful for workers who travel a great deal and for those not supported by the State's existing radio systems.

Multi-protocol Data Networking. In order to achieve the greatest functionality, and the greatest economy of scale, an objective of data communications is to be able to allow state agencies to connect any computer to any other computer using the Statewide data network.

Providing a multiprotocol network is one of the primary initiatives of ISD over the remainder of the decade. First, ISD must evaluate and establish a direction for the network which will be feasible for both continuing to provide the cost effective, reliable SNA services offered today and to allow agencies to establish high capacity LAN and Internet connections that are also reliable. Second, ISD must establish a timeframe and the funding resources for implementing this enhancement throughout the State. All this must be accomplished with limited budgets and within the framework of the computers and network architectures we operate today.

TRENDS

It is expected that the State Telecommunications Network will continue to expand substantially over the next five years due to increased video, data and telephone use. The network will not only reach out to more cities for voice and data traffic, but will continue to expand for video, two-way radio and wireless transmissions and for broadcast radio and public TV signals. The combination of all of this pressure will drive the network capacity up substantially. It is anticipated that in the 95 biennium the State will manage it's first DS-3 facilities (28 T-1's or the equivalent of 672 simultaneous telephone calls) as a critical component of the network.

During the next five years, the following trends are foreseen:

- General growth in voice, data, and video communications needs will dictate substantial growth in STN circuit requirements. The state will continue to make arrangements for digital technology where ever feasible. During this time, the state will continue to contract for local and long distance circuits from the industry. The state will only consider the capitalization of transmission systems in instances where substantial long term savings is projected over lease arrangements.

- Montana will continue to see large growth in the applications of Wide Area Networks. One of the major challenges for the State in the late 1990's will be to attempt to bring together higher speeds, flexibility and functionality of the "Decnet" environment with the wide availability, cost effectiveness and reliability of the SNA network. We believe the result will be a single, shared, truly universal data network that can allow any computer in the State to connect to any other.

- LAN traffic will continue to increase. Agencies, and state government as a whole, will become more and more reliant on these LANs to accomplish their mandated responsibilities. Interconnection to other agency LANs will become more important to agencies. Common products (hardware and software) will continue to be pursued, and government agencies will purchase from common contracts to acquire needed products in order to interoperate. Also during this time, standards in the industry will evolve which will allow for the integration of products from different manufactures over these LANs.

- Bulletin Board Systems will continue to find popularity. Access to other networks (MUSENET, INTERNET, etc.) will be achieved partly through these systems. State agencies will work closely together to limit the number of BBS systems deployed, while still meeting the various agency mandates.

- PBX's throughout the State will continue to be upgraded to maintain common capabilities throughout the network and to achieve cost savings. During this time we don't anticipate major replacement projects to be required. We do expect, however the need for modest investments in the existing systems in order to meet the demands placed on these systems. These systems will continue to provide the focal point for management of the SNA and for the state's telephone communications capabilities.

- METNET will continue to deploy Video Network equipment to up to a total of 14 sites. This will include Great Falls, Havre, Butte, Dillon, Lewistown and three rural sites still yet to be determined. During this time, we expect the use of these systems to grow substantially. Using two-way interactive video will become more accepted by educators and agency administrators. As digital technology continues to be deployed in the public

switched network, we should see improved capabilities to locate these systems at new locations at a relatively lesser expense.

- Satellite communications originating over the Ku Band uplink will increase, and schools and universities will receive more programming on downlinks. Educational, training, and public service broadcasts originating at two-way interactive sites will be carried to the uplink, transmitted to satellites, and received by METNET receive sites.

- Enhanced 9-1-1 features such as ANI and Automatic Location Identification (ALI) will be added to many systems, and an overall trend will develop for all systems to move toward these, and other, enhanced features. Also, 9-1-1 systems will lower their reliance on the public switched network by changing their routing schemes to utilize more dedicated lines or facilities. In order to make these improvements, however, increases in the 9-1-1 funding to local jurisdictions will likely be required. Within the next three years, 9-1-1 emergency telephone systems will be implemented to provide minimum 9-1-1 service to all telephones, regardless of their location, throughout the state.

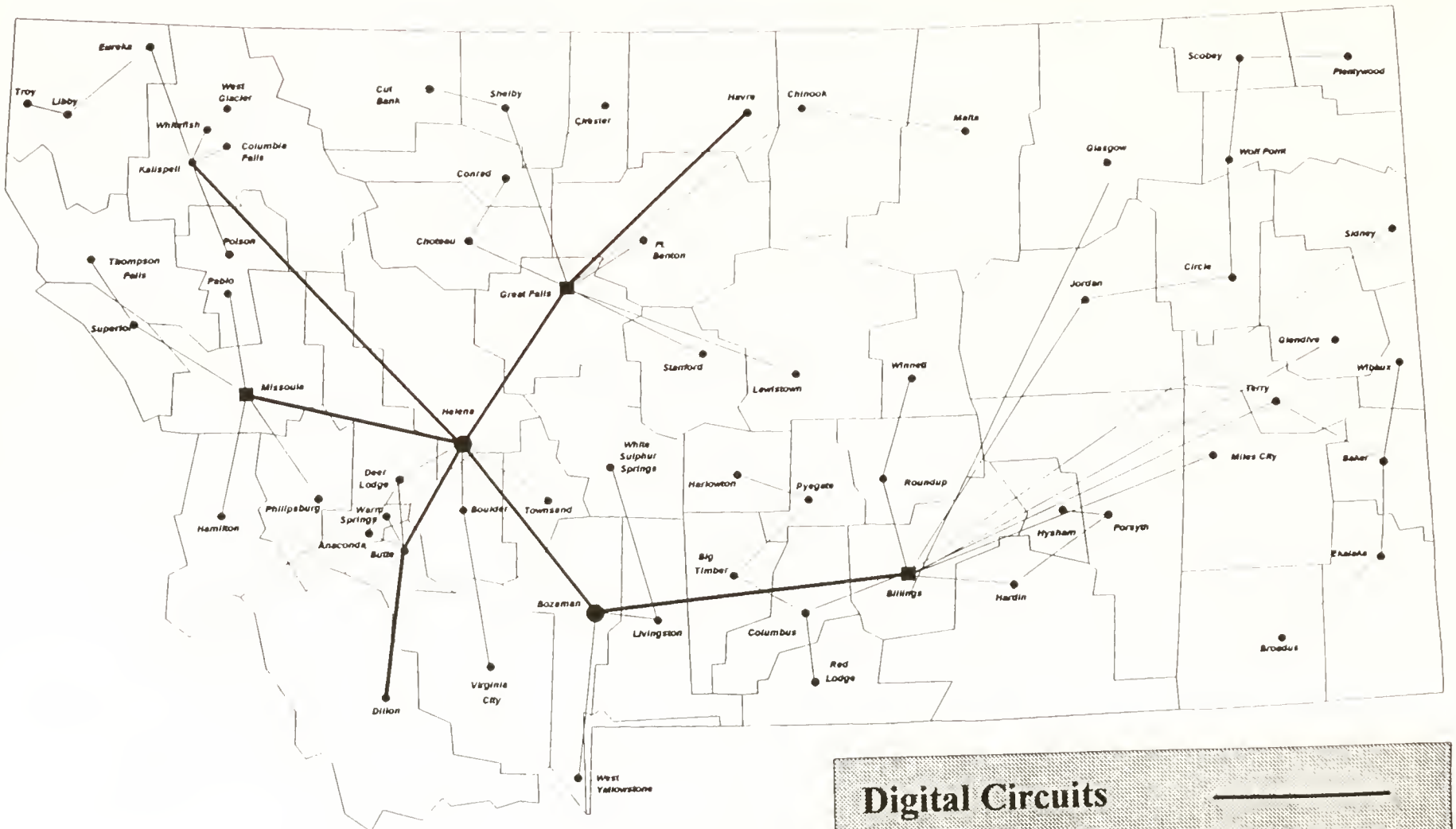
- Distance learning technology will increasingly be deployed in Montana. Video system and computer systems will combine to improve the educational process and more courses will be offered without concern of distance. Policies will need to be developed which properly reflect the educational communities' perspective on the offering and management of distance learning opportunities.

- Voice response technology will be acquired by ISD and managed centrally for all agencies to access. The public will interface with these systems as they are deployed and the improved services, at less expense, should be forthcoming.

- Cellular service will expand into more and more communities throughout Montana and its cost is expected to decline. This combination of larger service areas and improved costs will make the use of cellular more attractive to state agencies. Cellular will become an increasingly important piece of agency communications systems and will be coordinated with other statewide communications initiatives. Cellular or other wireless devices may at times replace telephone systems in State offices, providing greater worker mobility, reduced office relocation expenses, and less reliance on wireline networks. Likewise, agencies without radio service today will be able to have field communications for improved worker safety and responsiveness to the public.

State of Montana

Data Communications Network



Digital Circuits

Analog Circuits

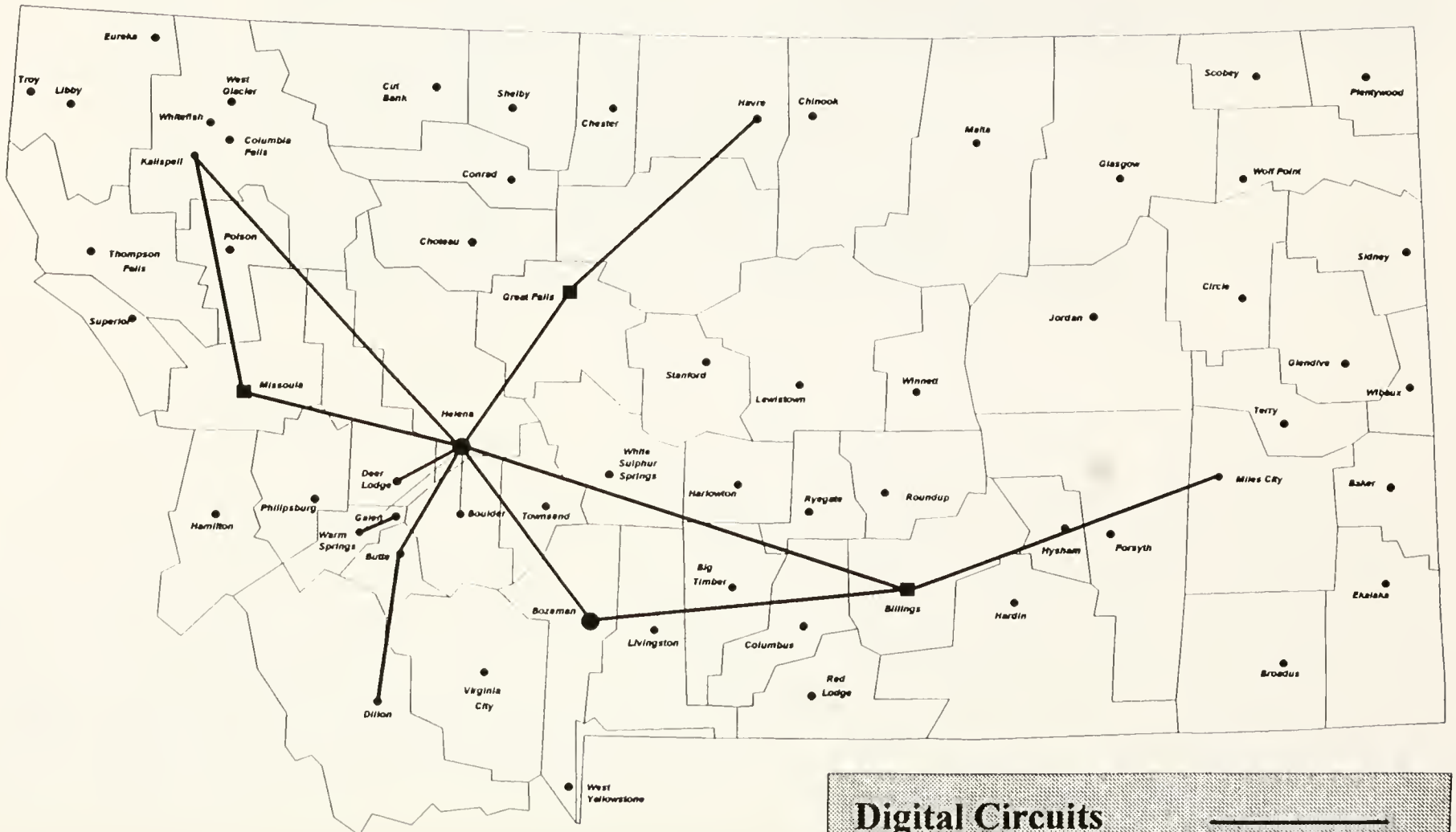
Computer Center

Concentrator

dmh/9-14-93
mtacnet1 pre

State of Montana

Telephone Network

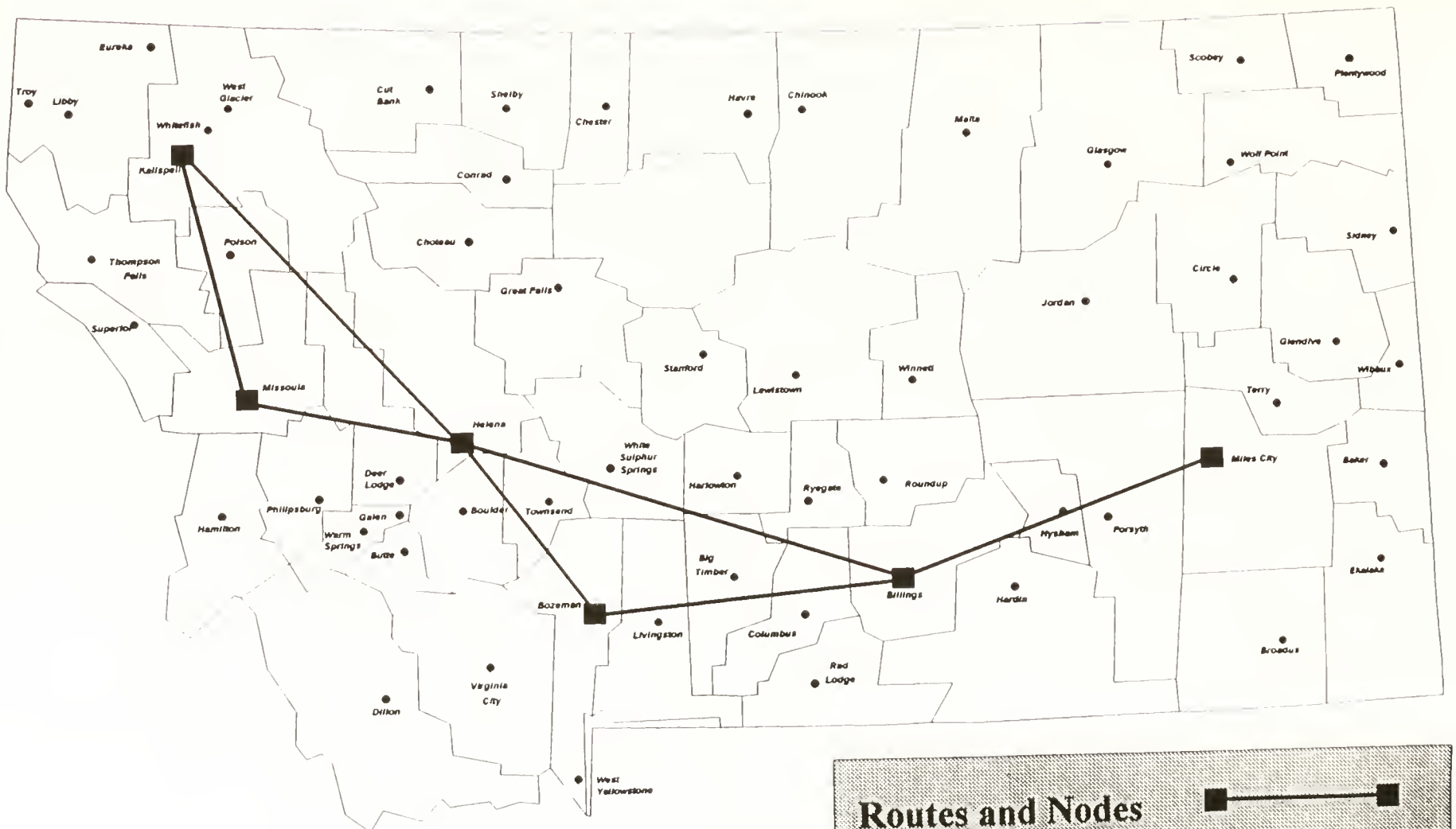


Digital Circuits ——————

Analog Circuits ——————

dmh/9-14-93
mtacnet1.pre

State of Montana
Compressed Video Network

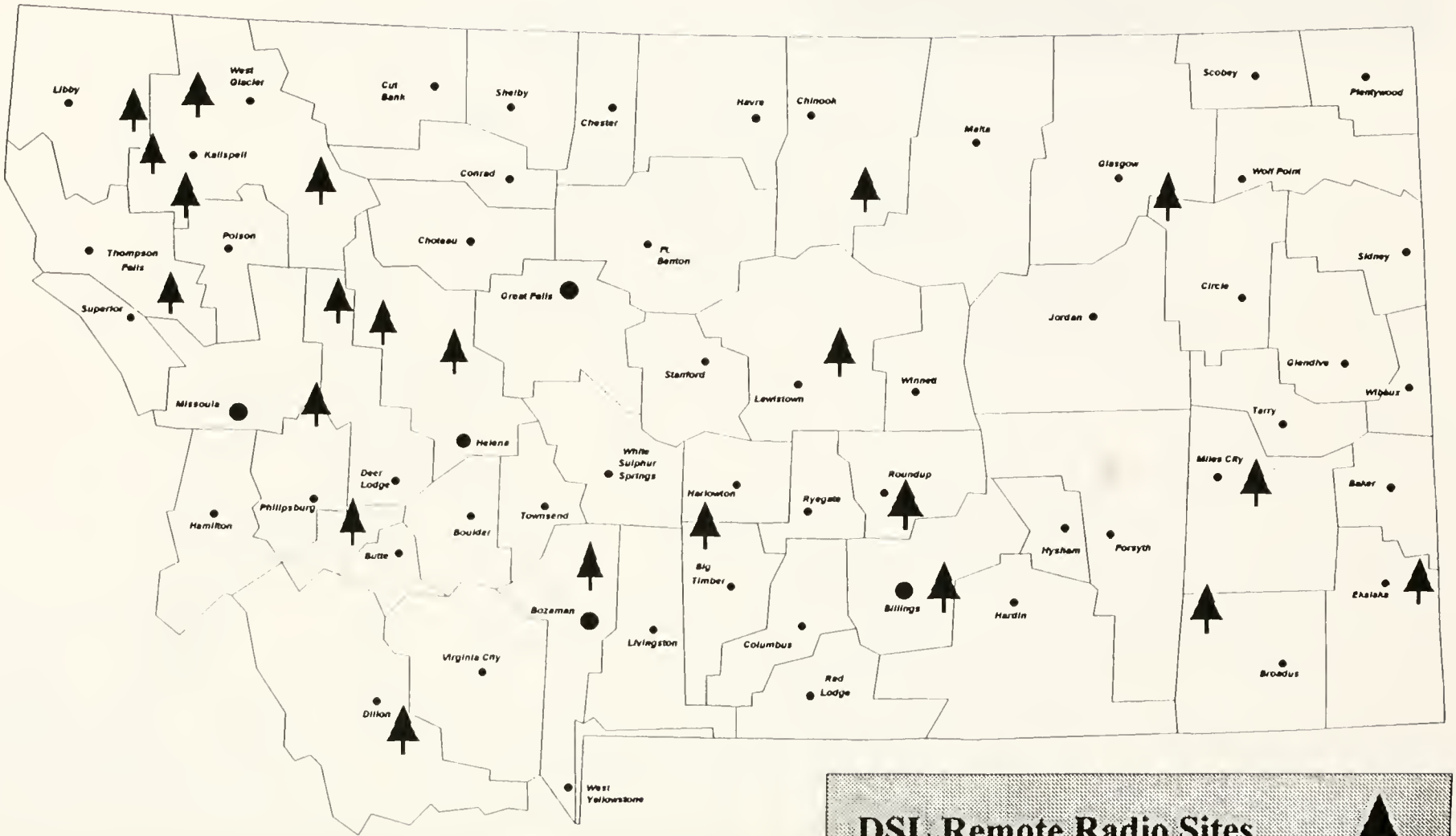


Routes and Nodes

dmh/9-14-93
mtacnet1.pre

State of Montana

DSL Mobile Radio Network



DSL Remote Radio Sites

NB: Remote base and mobile relay sites are shown.

dmh/9-14-93
mtacnet1.pre

State of Montana

Microwave Links

2 GHz Links

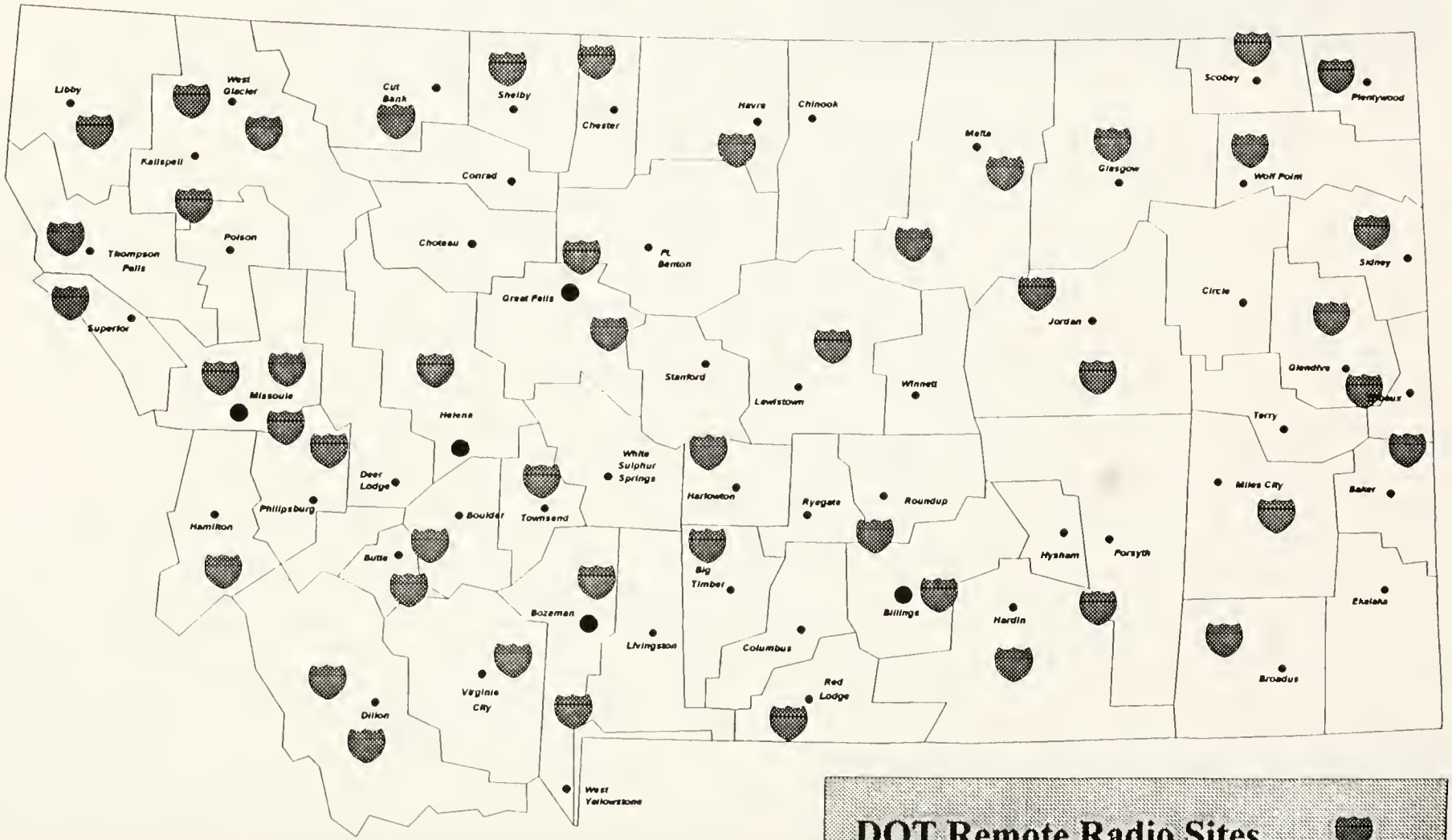
6 GHz Links

NB: Shorthaul links are not shown.

dmb/9-14-93
mtacnet1 pre

State of Montana

DOT Mobile Radio Network



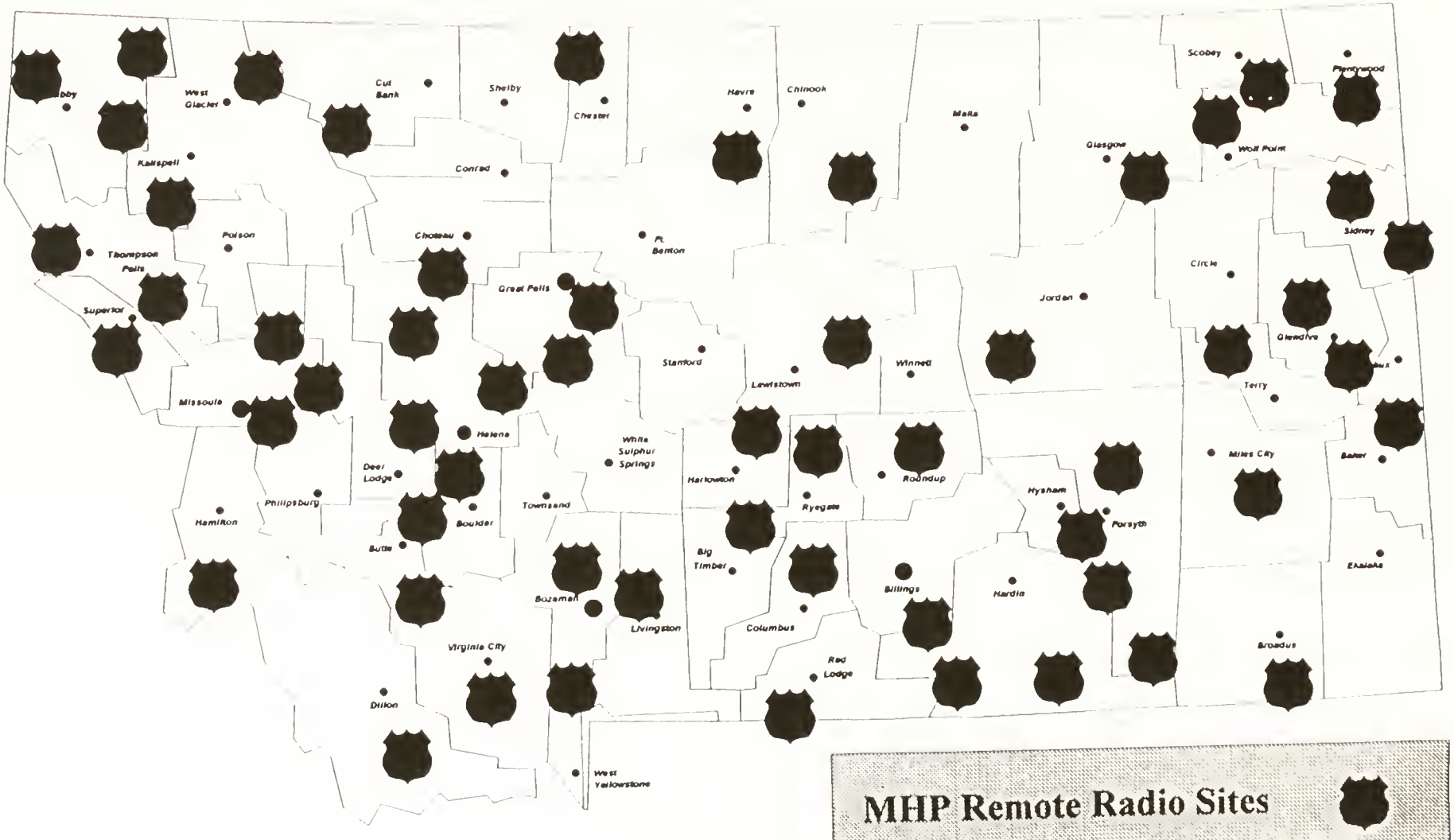
DOT Remote Radio Sites

NB: Only mobile relay sites are shown.

dmh/9-14-93
mtacnet1.pre

State of Montana

MHP Mobile Radio Network



MHP Remote Radio Sites

NB: Remote base and mobile relay sites are shown.

dmh/9-14-93
mtacnet1 pre

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY

MONTANA LONG RANGE PLAN

PREPARED BY:

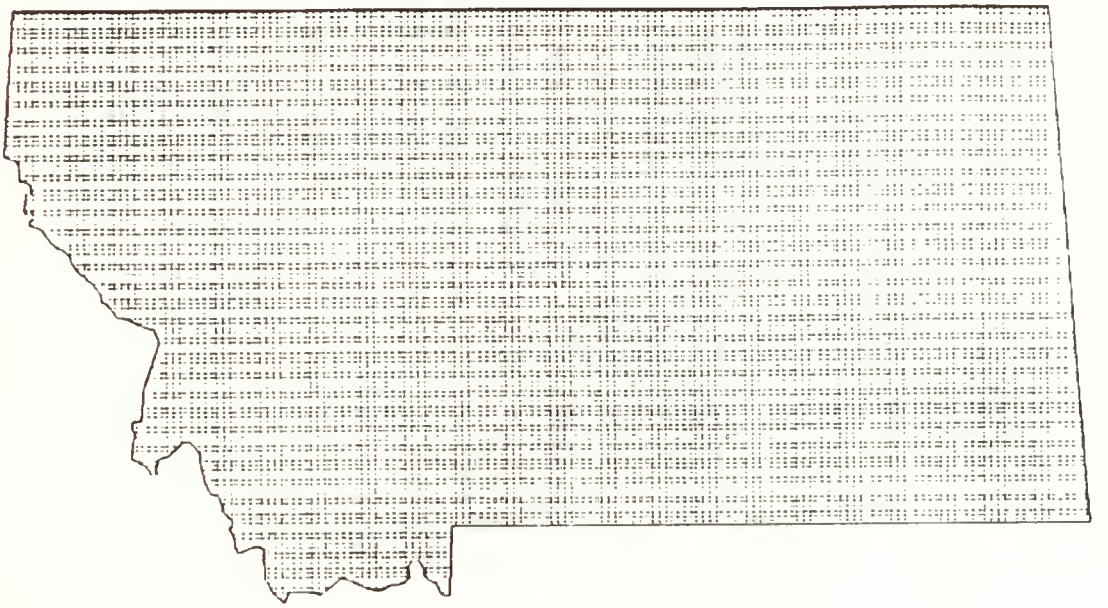
Nancy Zofferan

EMC Library
Eastern Montana College
1500 North 31st
Billings, MT 59101

(406) 657-1671

MONTANA'S LONG RANGE PROGRAM

1994 - 1996



As Assisted by the Library Services and Construction Act

Montana State Library
1515 East 6th Avenue
P.O. Box 201800
Helena, MT 59620-1800

April 1, 1993

Robert Klassen, Director
Public Library Support Staff
U.S. Department of Education
Library Programs
555 New Jersey Avenue, N.W.
Washington, D.C. 20208-5571

Dear Bob:

I am pleased to send you Montana's new LSCA Long Range Program. As you know, this has taken many hours of work on the part of members of the LSCA Advisory Council and State Library staff. We are pleased with the results and hope you will be also.

This document started as the work of three sub-committees once the Advisory Council identified its priorities for subgrant funding for FY '93. The three sub-committees each consisted of one Council member and one State Library staff member. The initial draft after approval by the Council was distributed statewide and three public hearings were held around the state on the Long Range Program, Miles City Public Library, Lewistown City Library, and Missoula Public Library. The hearings were audio taped and transcriptions of the hearings were provided to the Council as they worked on the next draft. The Library Services Advisory Council and State Library Commission each gave its final approval of the document at the respective meetings in December and January.

You will also note in this Long Range Program that one of the goals of the Montana library community is to work with the Montana Legislature to fully fund the State Library with State funds and free up the LSCA funds for subgrants. (Title II and III funds are distributed as subgrants currently while Title I funds are primarily used to fund the State Library, with the balance used for subgrants.)

We submit this document to you as further evidence of our interest in producing a document that is meaningful and workable to us while at the same time meeting the requirements of the Library Services and Construction Act program.

On separate pages are the priorities for funding under Titles I, II, and III and how Montana plans to address those priorities. These pages will be updated in the future as the Council and Commission determine state priorities for use of LSCA funds.

We would be happy at any time to discuss this Long Range Program with you or members of your staff.

Sincerely,

Richard T. Miller, Jr.
State Librarian

LSCA TITLES AND PURPOSES
(Priorities)

TITLE I:

1. **Public Library Services to areas without services:**

   The Montana Library Services Advisory Council and State Library Commission have chosen to address this Priority in FY '94.

   page 1

2. **Public Library Services to areas with inadequate services:**

   The Montana Library Services Advisory Council and State Library Commission have chosen to address this Priority in FY '94.

   page 2

3. **Services to the Disadvantaged:**

   The Montana Library Services Advisory Council and State Library Commission have chosen to address this Priority in FY '94.

   page 5

4. **Physically Handicapped:**

   The Montana Library Services Advisory Council and State Library Commission have chosen to address this Priority in FY '94.

   page 6

5. **State Institutional Library Services:**

   The Montana Library Services Advisory Council and State Library Commission have chosen to address this Priority in FY '94.

6. **Strengthening State Library Administrative Agency:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

7. **Major Urban Resource Libraries:**

Not applicable

8. **Strengthening Metropolitan Public Libraries:**

Not applicable

9. **Limited English-speaking Proficiency:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

10. **Services to the Elderly:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

11. **Community Information Referral Centers:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

12. **Literacy Program:**

This priority was addressed in FY '93 by the Council and Commission, but it was determined not to address it again in FY '94.

13. **Handicapped:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

14. **Intergenerational Library Programs:**

This priority was addressed in FY '93 by the Council and Commission, but it was determined not to address it again in FY '94.

15. **Child Care Centers:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

16. **Model Literacy Centers:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

17. **Drug Abuse Prevention:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

18. **Administration:**

The Montana Library Services Advisory Council and State Library Commission have addressed this as a priority for FY '94.

page 10

TITLE II:

1. **To Assist the Construction and Renovation of Public Libraries:**

The Montana Library Services Advisory Council and State Library Commission have addressed this as a priority for FY '94.

page 13

2. **To Assist Libraries in Acquiring, Installing, Maintaining or Replacing Substantial Technological Equipment:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

TITLE III:

1. **Planning of Cooperative Library Networks:**

This priority was reviewed by the Council and Commission and they determined not to address it at this time.

2. **Establishing, Expanding and Operating Library Networks:**

The Montana Library Services Advisory Council and State Library Commission have addressed this as a priority for FY '94.

page 14

3. **Planning for Statewide Resource Sharing:**

   The Montana Library Services Advisory Council and State Library Commission have addressed this as a priority for FY '94.

page 16

4. **Technological Capacity for Interlibrary Cooperation/Resource Sharing:**

   The Montana Library Services Advisory Council and State Library Commission have addressed this as a priority for FY '94.

page 17

5. **Preservation Programs:**

   This priority was reviewed by the Commission and Council and they determined not to address it at this time.

MONTANA LSCA LONG RANGE PLAN DEVELOPMENT

TITLE I
PRIORITY #1 - Public Library Services to Areas without Services:

NEED:

Montana is geographically the fourth largest state in the United States and is divided into fifty-six county political subdivisions. There are 111 public libraries, including branches and other outlets, in fifty-four of the fifty-six counties. Forty-one of the 83 public libraries (main libraries) provide county-wide library services.

A prior long range program, "A Choice of Futures, A Future of Choices", reminds us that, "Within Montana's boundaries and cutting across all its geographical areas are groups of users whose unique needs require special and sometimes unusual and creative library services." The Program further says that, fully aware of the unique demands placed on them by the state's physical, cultural, and intellectual diversity, Montana libraries will strive to assure all Montana citizens equal access to quality library services.

GOAL:

To ensure that all Montana residents have access to legally recognized public library service.

Objective:

By September, 1993, determine the number of geographic areas in the state that don't have legally recognized public library service.

By January, 1994, contact legal authorities of all those areas to offer assistance in initiating services.

Activities:

1.1 Demonstration of how public library service can be provided to the residents of the two counties without public library service has been set as a priority for grant funding.

1.2 Consulting assistance will be provided from the Library Development Program of the State Library to the two counties currently without public library service encouraging the provision of public library service by the counties

1.3 The Library Development Program will monitor the use of state aid funds for development of public library service in Treasure and Golden Valley Counties.

1.4 The Library Development Program will coordinate the compilation of statistical information which will show what geographic areas of the state lack adequate public library service.

TITLE I
PRIORITY #2 - Public Library Services to Areas with Inadequate Services:

NEED:

In the southcentral part of the state is Billings, the state's largest community which also has the largest public library. The service area for the library includes 107,733 people and the library's total collection is 251,554 items for a per capita collection of 2.33 items. Plains Public Library in the western part of the state has the smallest public library collection with 3,256 items; however, its per capita collection is 3.64. These statistics indicate that Montana is not a resource-rich state in terms of library resources.

The "Report of the Blue Ribbon Panel on Libraries at Risk" and the 1991 Montana Governor's Conference final report "That Every Citizen Be Information Rich" include several recommendations and resolutions concerned with ensuring that all Montana residents have access to the information they need regardless of where that information may be physically located and regardless of what format it may be in. Some of the most profound statements regarding library service for all Montanans can be found in the resolutions from the Governor's Conference that deal with Democracy.

GOAL:

To improve library service to those areas/peoples of the State not being adequately served, by expanding the ability of local public library personnel to increase their resource bases and external resources through electronic access, manage their local resources in the most effective way possible, and effectively market their services.

Objective:

By October 1, 1994 efforts will have been undertaken to assist public libraries in identifying areas/people not being adequately served and how to serve them.

Activities:

1.2 Public library projects for reaching area or community special populations which are not using the library or being served by the library will be a priority for grant funding.

1.3 Continuing education opportunities for librarians related to: community analysis skills, how to conduct outreach activities, serving special populations, identification and utilization of new technologies, marketing of services, and planning processes will be priorities for grant funding.

1.4 Projects demonstrating the ability of public libraries to serve their communities as educational institutions will be priorities for grant funding.

1.5 Innovative projects involving libraries demonstrating their ability to work with other agencies and organizations to enhance the services offered to the community will be priorities for grant funding.

1.6 Projects assisting school libraries in providing public library service in an area where public library service is not accessible or not readily accessible are a priority for grant funding.

Objective:

During the fiscal years 1994, 1995, 1996 the Montana State Library will support the State's 83 public libraries in their efforts to access external resources and manage local resources in order to provide adequate library service.

Activities:

2.1 The Information Resources Program at the State Library will continue its statewide role in resource sharing and networking by providing libraries in the state access to the holdings of the State Library and the WLN and OCLC databases.

2.2 The Information Resources Program at the State Library will continue its statewide role as a Ready Reference resource for the state's public libraries.

2.3 The Information Resources Program at the State Library will provide information services to those parts of the state inadequately serviced by libraries.

Objective:

During fiscal years 1994, 1995, 1996, the Montana State

Library will provide leadership and assistance to the State's 83 public libraries in how to access external resources, manage local resources, and market their services in order to provide adequate library service.

Activities:

3.1 The Library Development Program at the State Library will either offer or will identify continuing education opportunities for librarians on how to perform outreach, identify special populations, and plan for offering library services to special populations.

3.2 The Library Development Program will identify individuals needing assistance in acquiring professional training. A priority for grant funding may be for financial assistance in achieving the ALA-accredited master's degree.

3.3 The Library Development Program at the State Library will coordinate a statewide needs assessment to determine the geographic areas of the state that may be receiving inadequate library service.

3.4 The Library Development Program at the State Library will provide consulting assistance to those parts of the state inadequately serviced by libraries and to the state's libraries regarding: library information technologies, resource sharing and related issues, continuing education and professional development opportunities, development of grant ideas, and help with identification of other agencies and organizations interested in library services.

3.5 The Library Development Program will provide leadership regarding the need for libraries to do planning and offer consulting assistance to libraries to engage in a planning process.

3.6 The Library Development Program will coordinate a statewide assessment of the strengths and weaknesses of the state's public libraries.

3.7 Consulting assistance will be available from the State Library's Library Development Program for school libraries interested in providing public library service to their communities.

3.8 Consulting assistance will be provided from the Library Development Program on identifying local populations to which libraries should be marketing their services.

TITLE I
PRIORITY #3 - Services to the Disadvantaged

NEED:

The 1991 Montana Governor's Conference on Libraries and Information Services and the 1991 White House Conference on Library and Information Services cited the need for libraries to serve members of special groups and multicultural, multilingual populations for whom library access may be a problem. The Montana Governor's Conference final report also refers to the need to provide library access for the disabled and homebound.

The Governor's Conference report suggests an increase be made in the number of Native American librarians within Montana. The resolution addressing this need stated that Native American librarians will be able to access more primary Indian materials and serve as role models for young Native Americans.

The Governor's Conference also recognized a lack of awareness of the Native American culture in Montana by non-Indians.

The 1991 White House Conference on Library and Information Services Summary Report emphasizes the need for libraries to have collection development policies which provide universal access to all forms of information and materials by meeting the diverse needs of users, including those with language and cultural background differences.

GOAL:

To strengthen the statewide access to and provisions for library resources and information services to the economically disadvantaged and culturally disadvantaged with particular emphasis on the elderly and Native Americans in rural areas.

Objective:

By September 30, 1994, 25 libraries in the state will have planned, developed, maintained, and promoted library-related programs and services that provide increased access by, and involvement of, special populations, especially the elderly and Native Americans.

Activities:

1.1 Projects which target the development, maintenance, or expansion of library programs and services to the disadvantaged, with emphasis on the elderly and Native American populations, will be a priority for grant funding.

1.2 Projects which provide training programs for library staff on how to better serve special populations will be a priority for grant funding.

1.3 Library Development Program staff and the statewide Collection Management Committee will revise collection management policy guidelines to determine if they are adequate to provide increased emphasis on selecting and purchasing materials of interest to the elderly and to Native Americans.

Objective:

By September 30, 1994 fifty libraries in the state will demonstrate an increased awareness of Native American culture.

Activities:

2.1 Training in the area of collection development and the incorporation of Native American material in storytelling sessions will be a priority for grant funding.

2.2 Research on tribal artifacts, oral histories, and archives and the incorporation of this material in Montana's libraries will be a priority for grant funding.

Objective:

By January, 1994 programs designed to encourage and enable Native Americans to pursue careers in library work will be identified.

Activity:

3.1 Financial assistance for library career development for Native Americans will be a priority for grant funding.

TITLE I
PRIORITY #4 - Physically Handicapped

NEED:

According to the Library of Congress' National Library Service (NLS) for the Blind and Physically Handicapped, a minimum of 1.6% of the population is estimated to be eligible to receive Talking Book/Braille services. With a population of 799,065, this means

there are 12,785 Montana citizens who, because of blindness, visual impairment or physical disability cannot read standard print.

The goals of the long range plan Partners in Progress: states: "The Montana State Library for the Blind and Physically Handicapped (LBPH) will continue to expand and strengthen library service to the blind, visually impaired, and physically handicapped." As more libraries move to extend their services to all citizens, local libraries, the State Library and others should forge new partnerships to ensure adequate services.

GOAL:

To ensure that all Montana residents who, because of a visual or physical handicap, cannot read standard print or physically access a library facility, have free and equal access to library service.

Objective:

In each of the fiscal years, 1994-96, the State Library will provide library service to the 2400+ patrons who cannot read standard print or access a library facility.

Activities:

1.1 The Montana Library for the Blind and Physically Handicapped (LBPH) will provide reader's advisory to those users certified eligible for Talking Books.

1.2 The Montana LBPH will contract with Utah State Library to provide braille material to those who request it.

1.3 A summer reading program for all juvenile readers eligible to receive library service from LBPH if funding is available.

1.4 A pilot project in conjunction with local agencies including libraries and service clubs to develop a statewide volunteer program to provide patrons with personal visits to deliver machines and address problems with equipment or books will be a priority for funding.

1.5 All LBPH patrons will be acquainted via the newsletter with services available at local levels.

Objective:

By September 30, 1995, an additional 2400 potential users of the LBPH will be contacted to inform them about the service.

Activities:

2.1 Montana LBPH will provide outreach services by participating

in conferences, targeting special providers with mailings, producing and distributing public service announcements.

2.2 The Program will conduct public forums throughout the state in local libraries inform the public of the library service and receive input from existing patrons.

Objective:

In each of the fiscal years, 1994-96, the LBPH will record an average of 37 titles per year which are by Montana authors or about Montana and which are not recorded or distributed by NLS.

Activities:

3.1 Montana LBPH will record selected Montana-related titles to be duplicated and circulated to eligible patrons.

3.2 The remodeling of existing soundbooths and/or construction of new soundbooths at the Montana State Prison, to meet the standards of the Library of Congress' NLS quality control program, will be undertaken.

3.3 The Program will pursue the purchase of major equipment and supplies required to produce the Montana books.

3.4 A project to select, supply and record materials concerned with the culture and lives of Montana Native Americans will be a priority.

3.5 A project to select, supply and record children's material about Montana or by Montana authors will be a priority for grant funding.

Objective:

By the end of fiscal year 1995, the LBPH will implement an ongoing program of communication with patrons using a variety of methods for that communication.

Activities:

4.1 The LBPH will conduct a patron satisfaction survey and analyze the results of that survey.

4.2 The formation and operation of a Consumer Advisory Committee to provide a formal avenue for patrons to voice concerns about library service will be initiated.

4.3 The compilation, production, and distribution of a Consumer Handbook for LBPH patrons will be carried out through grant funding. This handbook would contain necessary information on

the equipment and books as well as policies and procedures of the library. A handbook will be sent to each patron.

GOAL:

To determine the impact of the Americans with Disabilities Act (ADA) on Montana's libraries.

Objective:

The State Library will attempt to determine the compliance with the ADA requirements on the part of the state's public libraries.

Activities:

1.1 The State Library will use existing forms distributed to the public libraries to assess local compliance with ADA requirements for public service providers and employers.

1.2 The State Library will include reminders of ADA requirements during the year in its various communications with the libraries.

1.3 ADA resources will be identified for consulting and education and shared with the community.

TITLE I
PRIORITY #5 - State Institutional Library Services

NEED:

Montana currently operates eleven state-run institutions with a total of fourteen outlets. Administrative oversight of these institutions at the state level is provided by the Department of Family Services and the Department of Corrections and Human Services.

Library service varies from institution to institution. Four of the institutions have librarians on site to provide services to residents, while residents in the remaining institutions receive services through a more indirect manner. Of the four institutions with librarians, three of the librarians are employees of either the Department of Corrections and Human Services or Department of Family Services, while the fourth is an employee of the Montana State Library. The Montana State Library provides book budget support for nine of the outlets and contracts with four public libraries in the state to provide library services to the other five outlets.

GOAL:

To provide adequate public library services for the people confined to state-run institutions, specifically: Montana

Developmental Center, Boulder; Veterans' Home, Columbia Falls; Montana State Prison, Deer Lodge; Montana State Hospital, Galen; Montana Drug/Alcohol Program, Galen; Montana State Hospital, Warm Springs; Eastmont Human Services Center, Glendive; Swan River Forest Camp, Swan Lake; Women's Correctional Center, Warm Springs; Mountain View School, Helena; Pine Hills School, Miles City; and School for the Deaf and Blind, Great Falls.

Objective:

During fiscal years 1994-96, the State Library will work to increase the involvement of the Departments of Corrections/Human Services and Family Services in the provision of library services in the state institutions.

Activities:

1.1 Projects that demonstrate innovative methods of providing library service to those in state institutions will be considered for grant funding priorities.

1.2 The State Library will continue to provide direct service to the patients of the State Hospital in Warm Springs through the Patients' Library.

1.3 The Library Development Program will work to keep in place and update the Memorandum of Agreement with the Department of Corrections and Human Services.

1.4 The Library Development Program will pursue the writing and implementation of a Memorandum of Agreement with the Department of Family Services.

1.5 The Library Development Program will continue to offer consulting assistance to the Department of Corrections and Human Services on the library facility for the new Women's Correctional Center, should it be constructed, and will work for library service equivalent to that of the Men's Prison for the inmates of the Women's Correctional Center.

1.6 The State Library will pursue increased book budget support for the Institutions from the Departments of Corrections and Human Services and Family Services.

1.7 The State Library will continue to administer the contract program which provides library services to five of the state-run institutions.

TITLE I
PRIORITY #18 - Administration

NEED:

The administrative unit of the Montana State Library provides financial, technical and administrative support functions for administering funds granted the state under the Library Services and Construction Act. It also provides leadership and direction through various advisory and governing groups by providing perspective, forums for the discussion of library issues, and a vision for the future of Montana's library services.

GOAL:

To ensure library services for the residents of the State of Montana through effective and efficient fiscal management of the Library Services and Construction Act (LSCA) funds.

Objective:

Establish for the 1994-95 biennium and each biennium thereafter an appropriation, to be in place by July 1, for the LSCA funds.

Activities:

1.1 Keep the Offices of Budget and Program Planning and Legislative Fiscal Analyst abreast of Maintenance of Effort (MOE) requirements for LSCA.

1.2 Monitor all LSCA disbursements for the State Library.

1.3 Submit the fiscal information for the Annual Program, Annual Report and cash reports.

1.4 Assist auditors with biennial audit that also complies with the Single Audit Act.

Objective:

Provide staff support for four meetings per year of the Library Services Advisory Council.

Activities:

2.1 Work with Chairperson of Council to determine meeting agendas.

2.2 Distribute agendas and minutes for all Council meetings.

2.3 Arrange for time on Commission meeting agenda for report from Advisory Council.

2.4 Provide funds for the meetings and activities of the Library Services Advisory Council.

2.5 Monitor the budget for the Advisory Council.

Objective:

Establish and maintain contact with a minimum of two agencies (private and/or public) per year for coordination of activities related to literacy.

Activities:

3.1 Continue contact with the Adult Education Program at the Office of Public Instruction for possible partnerships for public libraries in their own communities.

3.2 Work with the new Governor and staff to ensure awareness of illiteracy problem within the state.

3.3 Keep in contact with Montana State University's Center for Community School Development and Field Services regarding local communities and literacy.

3.4 Increase contact with local literacy programs.

GOAL:

To ensure library services for the residents of the State of Montana through funding of the State Library from the Montana State General Fund.

Objective:

Beginning with the 1995 Legislative Session, the Montana library community will seek full funding of the State Library's operations from the State's General Fund.

Activities:

1.1 The Montana State Library Commission will set as a legislative priority full funding of the State Library from the General Fund.

1.2 The Montana Library Association will set as a legislative priority lobbying for full funding of the State Library from the State's General Fund.

1.3 The Montana State Library Staff will develop a budget for the 1995 biennium that requests full State support for the operations of the Agency and moves all Title I LSCA funds into the competitive grant program.

TITLE II: Public Library Construction and Technology

NEED:

"The citizens of Montana have the right to expect library service to include use of library facilities . . ." is a statement in a resolution from the 1991 Montana Governor's Conference. This statement emphasizes the importance of adequate library facilities in the provision of library service. In reality, to date Montana's Title II program has been one that is demand-driven rather than one that necessarily is needs-driven.

The last re-authorization of LSCA included technology as an eligible expenditure under Title II. At this time in Montana, LSCA Title II continues to be used for construction and/or remodeling projects for public libraries.

GOAL:

To administer a grant process that is designed to provide facilities that will enhance the efficient delivery of public library service to the residents of Montana.

Objective:

By March, 1994, there will be developed by the State Library, Advisory Council, and Commission an agreed upon needs-based assessment process to serve as the basis for awarding Title II LSCA grants.

Activities:

1.1 The State Library will conduct a needs assessment on the status of the state's public library buildings.

1.2 Pending the results of the statewide assessment on the status of the state's public library buildings, the State Library potentially will recommend to the Library Services Advisory Council and the State Library Commission the use of LSCA Title II funds for technology improvements in public libraries.

1.3 Pending the results of this assessment, the Advisory Council and State Library Commission will consider seeking state legislation for establishment of a state-funded library construction fund to complement the LSCA Title II program.

1.4 Library Development Program staff will evaluate the current Title II grant process and make recommendations for future grant cycles.

TITLE III
PRIORITY #2 - Establishing, expanding and operating Library Networks

NEED:

The White House Conference, Libraries at Risk, and the Governor's Conference all spoke to the issue of networking and its importance, especially in a resource-poor state such as Montana.

The Omnibus Children and Youth Literacy Initiative passed by the WHC delegates is a comprehensive recommendation relating to the need to improve library services to this group. It calls for partnerships among libraries and day care centers and other early childhood care providers; recommends "youth at risk" demonstration grants for outreach services to be provided through partnerships; calls for other partnerships between school and public libraries to provide comprehensive library services; cites the need for school media centers to have access to the nation's resources; recommends joint public/school family literacy activities; and requests grants for collaborative training for school and public librarians.

Another WHC recommendation notes the need to network small, rural, urban and tribal libraries to ensure access to basic library services, and requests federal funding to ensure that all have access to at least one terminal to access the National Research and Education Network.

Libraries at Risk notes that the State Library Commission and the Office of Public Instruction (OPI) should push the collaboration between school and public libraries; and calls for additional holdings from the state's specialized collections to be added to the WLN database to ensure access to such resources to all.

The Governor's Conference passed four resolutions relating to these aspects of networking including the:

- Need to expand interlibrary loan, to provide a statewide library card, and to share staff expertise.
- Need to expand the concept of the statewide library card to school, academic and some special libraries.
- Need for cooperation among different types of libraries to promote a statewide library card.
- Need for the Commission and OPI to foster alliances to provide joint school/public libraries where appropriate.

Note: There can be no discussion of library networks in Montana without some mention of The WLN. WLN has played an important part in networking, cooperation, and resource sharing in Montana's

libraries since the early 1980's. It has been Montana's database of choice for a number of years, and Montana as a state and as individual libraries, has a made a substantial financial commitment to it as well. WLN will play a role in any decisions Montana's library community should make regarding library networks now or in the future.

GOAL:

To enhance the concept and scope of activity of all libraries through the initiation, expansion and improvement of organizations and structures which allow greater sharing of current and planned resources.

Objective:

By July, 1994 the number of formal cooperative collection development agreements involving Montana libraries will be increased by six.

Activities:

1.1 Through CE opportunities and publications, the State Library and the Collection Management Committee will promote the need to add the holdings of all libraries to larger databases.

1.2 The Collection Management Committee will continue to provide support for adding library holdings to increase the WLN database.

1.3 The State Library will ccordinate the investigation of the most cost effective means for providing wide access to inexpensive, quality cataloging and holdings information including how WLN's LaserCat fits current and future needs in the state.

GOAL:

To improve the ability of libraries to provide services to their targeted clientele and special population groups by their involvement in such networks, because of improved access to a greater variety and depth of resources.

Objective:

By January 1994, there will be a least one statewide discussion of public libraries to discuss cooperative collection development, with this discussion beginning in each federation.

Activities:

2.1 The Library Development Program will communicate the objective to the Federation Coordinators for federations to consider endorsing/funding such a meeting through their plans of service for FY 1994.

Objective:

Beginning in the Fall of 1993, the number of formal agreements between libraries of different types and libraries with other agencies and entities having shared clientele will be identified and documented.

Activities:

3.1 The State Library will provide support for combination libraries (e.g., school/public, public/academic joint libraries) when it can be shown that such combinations are the most cost effective means of providing such services and that such combinations will enhance rather than diminish services to clientele.

3.2 The State Library and Advisory Council will explore funding alternatives for the support of statewide library networking, both within the public and private sectors.

3.3 Demonstration projects for libraries and other agencies cooperatively developing parent/family education services for early childhood will be considered for grant funding.

3.4 Partnerships between libraries and early childhood service providers to offer collection development and training in the use of library resources will be considered for grant funding.

3.5 Outreach services to youth at risk projects through collaboration with community youth service agencies will be considered for grant funding.

Title III
PRIORITY #3 - Planning for Statewide Resource Sharing

Need:

"Cooperation is already a priority for Montana's libraries. No library can function effectively without a basic core collection to serve the day-to-day needs of its users, yet no library can afford to own every book or magazine. The collective materials in Montana's libraries may be inadequate by many standards, but an improved means of sharing these resources would allow all of the state's libraries to offer better library and information services.

Cooperation, through the sharing of already existing resources, makes economic sense."

REPORT OF THE BLUE RIBBON PANEL ON LIBRARIES AT RISK TO THE MONTANA STATE LIBRARY COMMISSION

In May, 1992, the first ever Network Symposium was held in Montana. Those libraries with online systems were participants and others in attendance were guests. NOTE: Montana does not have a statewide system. Libraries have been able to make independent decisions as to what system to select. As of May, 1992, three major systems were represented in the state: Dynix, CLSI, and INLEX.

The major emphasis of the Symposium, technology aside, is embodied in the question, "How do we provide statewide access to our materials so that it doesn't matter where you live in Montana when you have an information need?"

Goal:
To ensure residents of Montana have access to all library resources within the state's geographic boundaries.

Objective:
By 1999, 50% of the state's libraries will have 50% of their holdings (books and journals) in the WLN database.

Note: Currently 119 Montana libraries have their holdings in the database.

Activities:
1.1 During FY '94, the statewide Collection Management Committee will determine what percent of the state's library holdings are in the WLN database.
1.2 During FY '94, the statewide Collection Management Committee will assess the strengths and weaknesses of the Montana holdings in the WLN database.
1.3 For FY '95, the Library Development Program will consider recommending to the Advisory Council subgrant support for recon projects.

TITLE III
PRIORITY #4 - Technological capacity for Interlibrary Cooperation/ Resource Sharing

NEED:
Resolutions approved at the 1991 White House Conference on Libraries and Information Services, concerns expressed during Montana's Governor's Conference, and the Blue Ribbon Panel Report

all note the need for libraries to be up-to-date in offering improved access to information via new technology. This is especially true in a state whose population is as widely dispersed and sparse as Montana's, and in a state as resource poor as ours. A number of network schemes have already sprung up -- EBB's such as Big Sky Telegraph and METNET, MUSENET (a consortium of university systems) and others. Libraries must be "in the loop" in these developments, or face the prospect of becoming anachronistic institutions of less and less use to the general public.

GOAL:

To ensure that as many libraries as possible have access to the technological capacity to enable them to participate in the sharing of resources, both materials and staff expertise.

Objective:

Starting July 1, 1994, libraries in Montana will be able to establish linkages to various technological pathways and partnerships between local libraries and the private sector will develop.

Activities:

1.1 Libraries in the state will engage in active information gathering on local, state and national levels in order to be knowledgeable about current and future links to databases and telecommunications networks.

1.2 The Advisory Council and Commission will encourage technological linkages by offering challenge grants to libraries which provide remote access to their collections. These grants are to be matched by local funds including cash and in-kind contributions from the private sector.

Objective:

Beginning with Fiscal Year 1993, at least one resource-sharing project each year will be funded that minimizes geographic isolation or the lack of local fiscal resources.

Activities:

2.1 The distribution of grants will be balanced such that rural, isolated areas, as well as more populous areas, are assured access to resource sharing methods.

2.2 The State Library and Advisory Council will study the ability of the local library and local partners in the private sector to support and sustain any technological advances provided,

looking for innovative delivery of such access rather than one method for all.

Objective:

In each fiscal year, 1994-96, at least one statewide training program will be provided for library staffs, to teach the most effective use of new technology affecting library services.

Activities:

3.1 The State Library will provide and/or coordinate statewide training opportunities for library staffs during library conferences and at other times.

3.2 Demonstration projects involving libraries offering distance education to the general public using technological means of delivery will be considered for grant funding.

The STN (State Telecommunications Network) provides voice, data, and video communications to agencies of government (state and local, education, and law enforcement) throughout the State. Data networking is one of the fastest growing telecommunications areas.

MUSENet (Montana University System Educational Network) is routed and managed on circuits separate from the State's SNA network. The network adheres to industry standards (RFC 1140, IAB, OPS) assuring compliance, expandability, and adaptability. The educational and economic advantages of this system-wide, coordinated program are obvious. The time sharing interconnectivity affords direct access to every campus of the six units of the University System.

The highly successful networks are not static but continue to increase and improve services, due to the expertise and involvement of highly qualified personnel in the computer centers. Enhancements in 1992 included the introduction of TCP/IP and routers or bridges at the four state colleges and expansion of those capabilities at the two universities. Libraries on each campus are automated (to varying degrees of completion). One of the truly exciting benefits of library automation is that, not only do they have the advantages of an automated library with state-of-the-art hardware and software, but they also have a route through the same connection, to unlimited, high speed computer facilities and resources (Internet). The "trickle-down" effect continues to produce positive influences on the communities as each community will have dial access through local phone numbers to the resources on the network. Users at the K-12 facilities, health care providers, businessmen, state workers at remote sites (research stations, Dept. of Fish, Wildlife, Parks, etc.), and the general public will enjoy the benefits of this connectivity.

Future growth and development will be measured in terms of increased speed, better quality of voice, video, and data transmission, and expanded resources on the network. The University System is exploring and assessing the value and application of new developments in telephony, wireless, cable and other opportunities. The "best solution" is going to be the one that focuses on reducing or eliminating barriers, providing comprehensive and wide-spread access at the lowest possible cost. MUSENet and the State should pursue an aggressive program of information services. A cooperative attitude coupled with the common desire to provide a rich and powerful environment is tantamount to our mutual success.

Systems and Computing Services

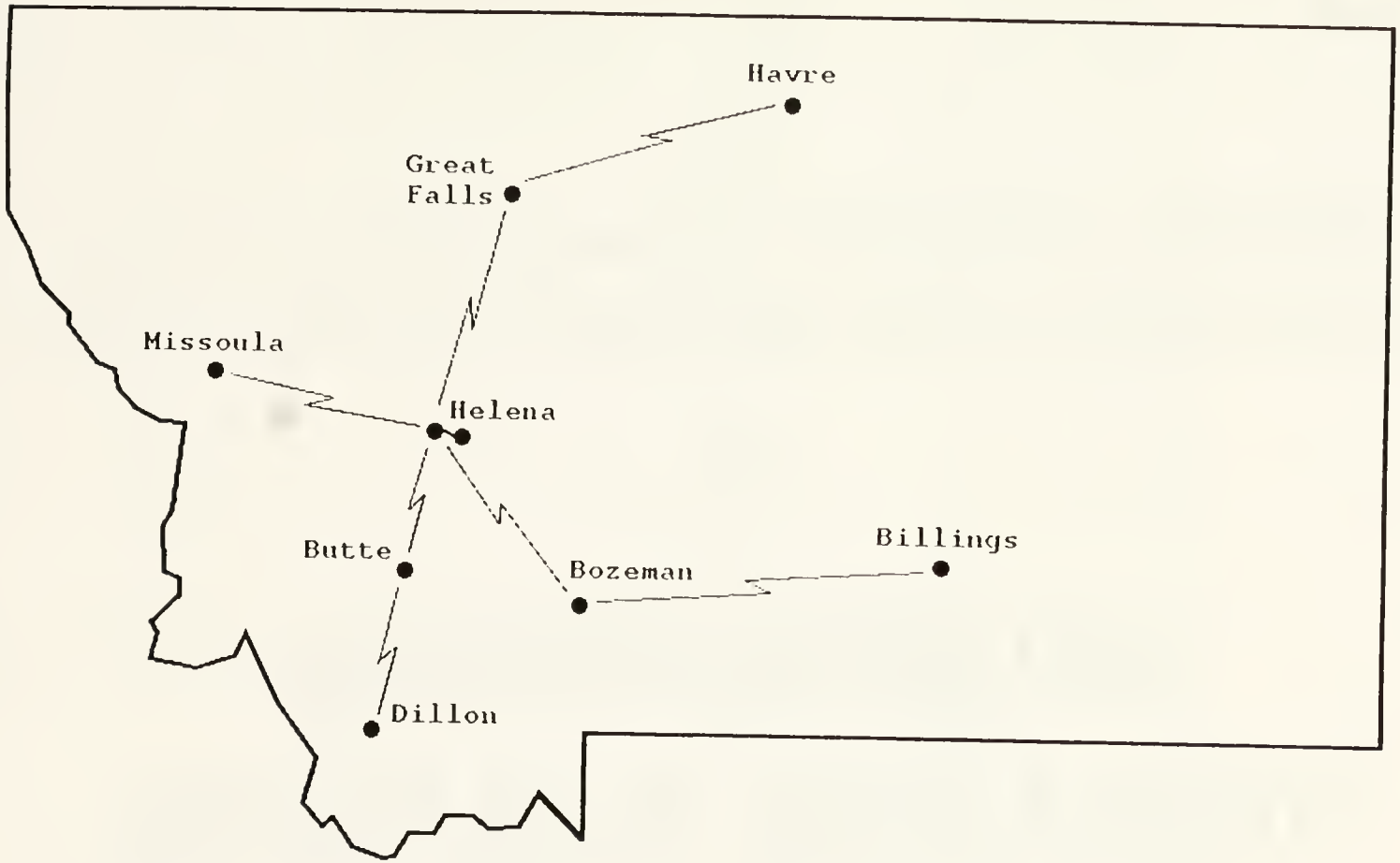
Network Services Presentation

by

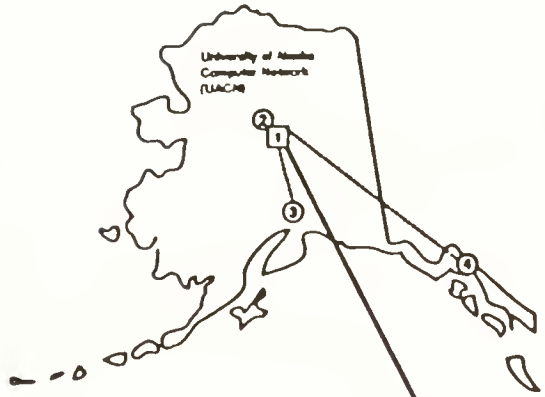
Dave Harvey, Educational Coordinator
Allen Porter, Senior Systems Analyst

MONTANA STATE UNIVERSITY
1893 • CENTENNIAL • 1993

Montana University System Education Network (MUSEnet)



NorthWestNet



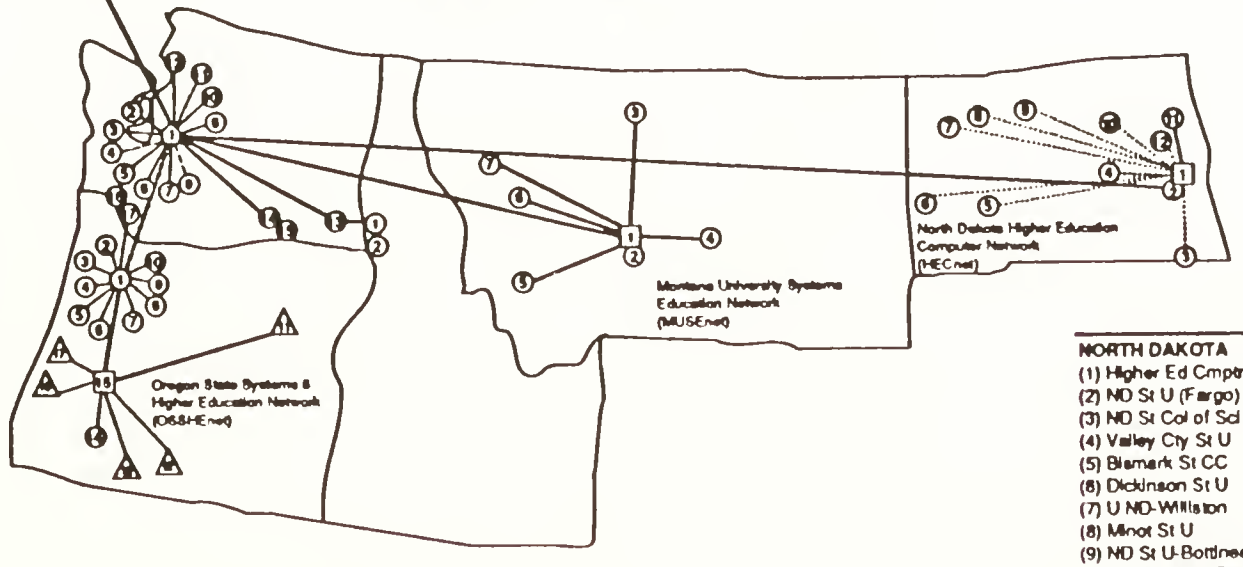
ALASKA
(1) U AK Cmptr Net (UACN) (Fairbanks)
(2) U AK, Fairbanks
(3) U AK, Anchorage
(4) U AK, Southeast (Juneau)

LEGEND

- Member Connecting to the National Science Foundation Network (NSFnet)
- Member Connecting Statewide Network
- Member
- Non-member Connected to NorthWestNet by Statewide Network
- 1.5 mbps
- 56 kbps
- 9.6 kbps

WASHINGTON
(1) U WA (Seattle)
(2) Pac Marine Env Labs (NOAA) (Seattle)
(3) Walker, Richer & Quinn (Seattle)
(4) Fred Hutchinson Cncr Rsch C (Seattle)
(5) Seattle U
(6) U Puget Sound (Tacoma)
(7) Evergreen St Col (Olympia)
(8) Boeing (Bellevue)
(9) Analytical Methods (Redmond)
(10) XKL Systems (Redmond)
(11) Microsoft (Redmond)
(12) Western WA U (Bellingham)
(13) WA St U (Pullman)
(14) Pacific NW Labs (Richland)
(15) WA St U (Richland)
(16) Clark Col (Vancouver)
(17) WA St U (Vancouver)

MONTANA
(1) MT U Sci & Ed Net (MUSEnet)
(2) MT St U (Bozeman)
(3) Northern MT Col (Havre)
(4) Eastern MT Col (Billings)
(5) Western MT Col (Dillon)
(6) MT Col of Min Sci & Tech (Butte)
(7) U MT (Missoula)



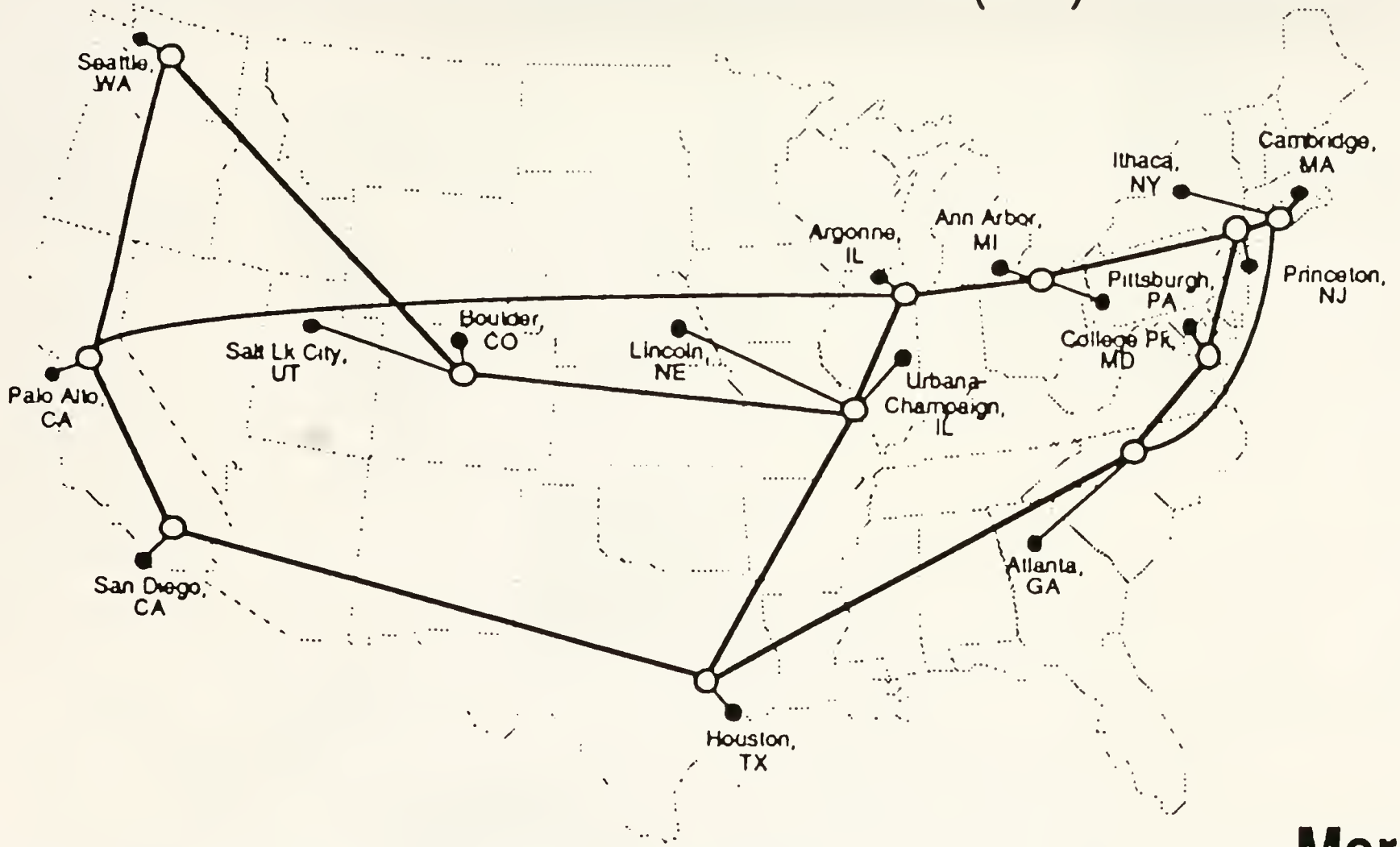
OREGON
(1) OR Grad Inst of Sci & Tech (Beaverton)
(2) OACIS (OR Adv Cmptng Inst) (Beaverton)
(3) Sequent (Beaverton)
(4) Pacific U (Forest Grove)
(5) Linfield Col (McMinnville)
(6) Tektronix (Wilsonville)
(7) OR Hlth Sci U (Portland)
(8) Portland St U (Portland)
(9) Reed Col (Portland)
(10) Lewis & Clark Col (Portland)
(11) Eastern OR St Col (La Grande)
(12) OR Inst of Tech (Klamath Falls)
(13) Southern OR St Col (Ashland)
(14) U OR (Eugene)
(15) OR St U (Corvallis)
(16) Hatfield Marine Sci Cnt (Newport)
(17) Western OR St Col (Monmouth)

IDAHO
(1) U of ID (Moscow)
(2) Adv Hrdwr Architectures (Moscow)

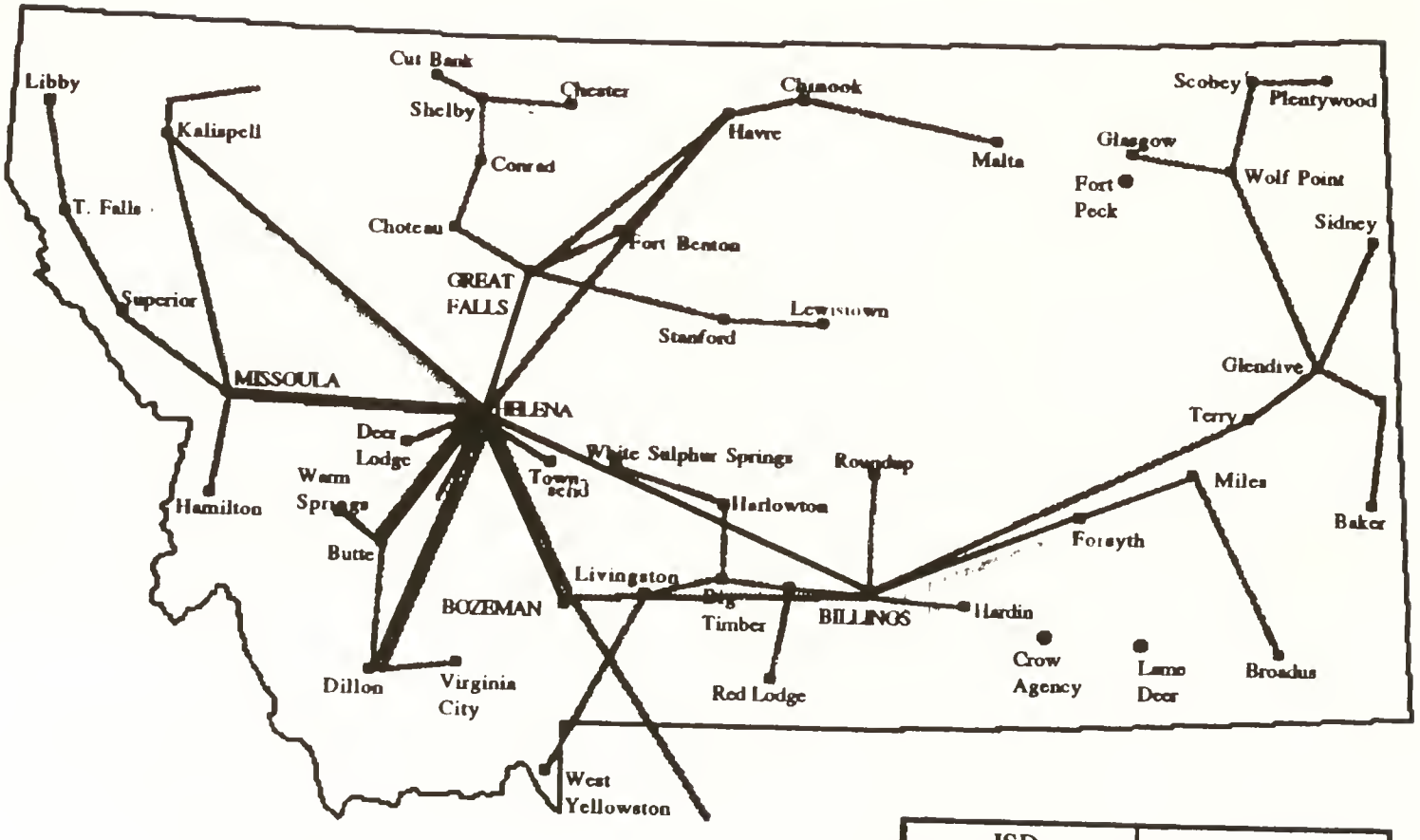
NORTH DAKOTA
(1) Higher Ed Cmptr Net (HECNet) (Fargo)
(2) ND St U (Fargo)
(3) ND St Col of Sci (Wahpeton)
(4) Valley City St U
(5) Bismark St CC
(6) Dickinson St U
(7) U ND-Williston
(8) Minot St U
(9) ND St U-Bottineau
(10) U ND-Lake Region (Devils Lake)
(11) U ND (Grand Forks)
(12) Mayville St U

Rev 7/91

NSFNET Backbone Service (T3) 1992



Merit



ISD	MUSENET
DIGITAL CIRCUITS ANALOG CIRCUITS	CURRENT CIRCUITS

Distance Learning a Reality with METNET

The Montana Educational Telecommunications Network (METNET), a cooperative venture between the Office of Commissioner of Higher Education, the Department of Administration, and the Office of Public Instruction, has linked schools and universities across the state to deliver upon the promise of distance learning. Regional training centers in fifteen locations serve as the focal point for educators to receive in-service training on how to use computers and satellite receive equipment, and as local access points for a computer based bulletin board system.

Using electronic bulletin boards, teachers and administrators are able to communicate with their peers across the nation to keep abreast with the latest developments in their field. Teachers can sign on to the regional bulletin board from their computer. They can select from over 120 conference areas to send messages back and forth with peers throughout the state, the nation, or the world. Each night METNET's central computer dials each regional computer, uploads the local messages and passes them on to the other regions.

Electronic bulletin boards satellite dishes, and video systems team up to offer distance learning.

Through matching grants, schools and universities have been able to purchase satellite receivers and dishes, modems and telephone lines, video cassette recorders and televisions to set up local distance learning centers. As a result there are over 250 satellite receive dishes located throughout Montana schools. They can receive nationally broadcast courses or "Made in Montana" courses like the *Montana Water Course* through the university system's satellite uplink facility at Montana State University.

Two-way compressed video conference/instruction facilities have also been installed in Helena and Bozeman to communicate with the university system sites in Missoula and Billings. The conference centers are equipped with sophisticated video and audio equipment so that participants can interact verbally and visually. Since the facility in Bozeman is co-located with the satellite uplink facility it is possible to transmit video conferences to a satellite and make them accessible to satellite receive dishes across the state.

With METNET the possibilities are limitless for development of Montana specific courses, for broadcasting important public hearings, for employee training, and for gaining access to high quality nationally developed courseware. METNET is sponsored by private businesses and the state of Montana to develop Montana's telecommunication capabilities to further enhance economic development, education and local government services.

Telecommunications Plan

1. School E-Mail

2. FIDO Systems
   A. METNET
   B. SILVERBOW BBS

3. INTERNET

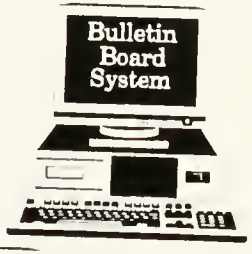
School District #1
Computer Network

Greeley

West Elementary

Emerson

Longfellow



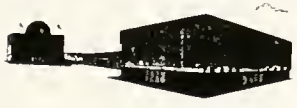
Margaret Leary

Butte High School

East Middle School

Webster Garfield

Whittier



Kennedy

Administration

Hillcrest

A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY

IN CABLE TELEVISION

(Cable's Role in the "Information Superhighway")

Compiled by:

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Billings, MT 59104

(406)245-3051

Source: CableLabs

Cable's Role in the "Information Superhighway"

A Position Paper

It is encouraging to learn that upgrading our country's telecommunications infrastructure is a prominent component of the new administration's "mandate for change."

There is a growing consensus that creation of what the Progressive Policy Institute has called an "information superhighway" — a broadband network serving all Americans — offers substantial payoffs. Among them:

- "Telecommuting" workers can be more productive, pollute less, and be better family members;
- "Distance learning" can raise the skill and education levels of millions of students and workers;
- Video teleconferencing can replace meeting-related air travel and driving trips on gridlocked highways;
- Interactive television can heighten civic awareness and stimulate public participation in government.

This document summarizes the role that the U.S. cable industry's network, which now passes 97% of all U.S. households, can play in this information superhighway.

Thanks to the ongoing and planned upgrades in cable's hybrid fiber optic/coaxial cable network, creation of such an information superhighway may be more affordable and closer at hand than many people believe.

U.S. cable companies today have built the only broadband electronic pipeline into the American home — a network capable of supporting, with relatively affordable upgrades, such productivity-enhancing services as high-speed document sharing between computers, video on demand, and two-way video teleconferencing.

Many of the upgrades cable companies are now making simply to provide better television service are exactly the steps required to transform cable systems from television-only carriers to high-capacity, high-speed digital networks.

This document presents a brief summary — as devoid of jargon as possible — of what cable has to offer in broadband networking. It addresses:

- Cable's progress to date in upgrading its network (in particular, its adoption of fiber optic trunk lines);
- Next-generation upgrades now being designed and implemented (extension of fiber optics to neighborhoods, digital compression, and addition of data-communications capabilities); and
- A comparison of cable's actions and incentives with those of other carriers, particularly the telephone companies (contrasting cable's passion for cost-containment against telcos' rate-of-return regulation, which provides incentive for them to maximize spending).

I. Cable's Progress to Date

Cable today is the nation's major video service provider, serving 62% of U.S. TV households, almost 55 million homes, who pay $20 billion annually for the service. Of all 93 million U.S. households, 91 million of them (97%) have coaxial cable running at or near their property line ("homes passed" in cable terminology). Almost 95% of cable subscribers have access to 30-54 channels, while 35% of subscribers receive 54 or more channels.

Cable's Growth — In Numbers

	1975	*1980*	*1985*	*1990*	*1992*
TV Households (millions)	69	77	85	92	93
Cable subscribers (millions)	8.5	15	38	54	56
Homes passed (millions)	23	35	65	83	89
Average system channel capacity	12	20	25	35	38
Network miles	321,000	375,000	740,000	864,000	1,089,000

Sources: A. C. Nielsen, Paul Kagan, Television Digest

Even with today's technology, the cable industry has been able to contribute significantly to political awareness and education. Examples:

- C-SPAN and C-SPAN 2 channels, whose $16.2 million budget comes entirely from cable companies.
- "Cable in the Classroom," which in the 1991-92 school year delivered more than 500 hours of commercial-free educational programs, at no charge, to 27 million students in 48,033 schools, at a cost to the cable industry of $81 million. In 1993, the program announced that the cable industry provides connections to 61% of all schools in the United States. That equates to 60,213 schools with 70% of the students.

- The Discovery Channel, Arts & Entertainment, and other cable network emphasize cultural and educational programming.

Cable is also a technological innovator. Research sponsored by the predecessor to Time Warner Cable in the mid-1980s led to major breakthrougns in optoelectronics — the transmission of signals through fiber-optic strands. The cable industry today spends $12 million annually through Cable Television Laboratories Inc. (CableLabs), a research consortium based in Boulder, Colo. In addition, the major cable companies and equipment vendors have their own large R&D programs. While the size in dollars of cable's R&D efforts is small compared to a Sematech or a Bell Labs, the entrepreneurial, budget-conscious tone of the cable industry has consistently produced big payoffs for limited R&D dollars.

Fiber Optic Trunk Lines

In 1992, cable spent $2.4 billion on construction, $1.4 billion of which went to rebuilding and upgrading existing plant and equipment. Installation of fiber optic trunk lines — which clean up signals, increase reliability, and cut operating costs — is accelerating rapidly, with fiber plant growing from 13,000 miles in 1991 to 23,000 miles at year-end 1992.

These fiber optic upgrades are being achieved at remarkably low costs. This is because cable systems' trunk lines account for less than 20% of total plant investment (75% of that investment is in the coaxial cable lines running into the home, which will remain in place). Cable companies are rapidly installing fiber optic trunk lines to neighborhood nodes of about 1,500 to 2,000 homes, at a cost of about $15,000 per mile.

Cable is carrying out this ambitious fiber trunking program with no public funding, federal or otherwise. In fact, cable, unlike telcos, was a major *contributor* to municipalities, adding about $900 million to city revenues through franchise fees in 1992.

Hybrid Fiber Optic/Coaxial Cable Networks

The major component of cable's network, coaxial cable, is very underrated. A coaxial cable's carrying capacity is at least 900 times that of the telephone companies copper "twisted pair" wires – probably a lot more than that in the digital domain that increasingly prevails in today's telecommunications world.

The cable industry has very patiently wired the nation with coaxial cable over the past 40 years. The current switch-over to fiber optic trunk lines is highly cost-effective in its own right because it permits the removal of amplifiers, which previously had to be present at quarter-mile intervals in all-coaxial systems. These amplifiers decreased the number of channels that could be carried and were a source of possible breakdowns and high maintenance costs.

Further, the amplifiers introduced "noise" that made upstream communication, from the home back to the cable system's headend, very difficult. Thus, fiber trunk lines are helping cable operators to activate an upstream, digital communication path from the home back to the cable system. By late 1992, 15% of U.S. cable systems had such two-way service and another 32-35% of systems had equipment in place that could easily be upgraded to two-way. For now, this upstream data path is used largely for ordering of pay-per-view movies and events. But its potential future uses are much greater.

II. Planned Cable System Upgrades

Even as this upgrade to fiber-optic trunk lines proceeds, cable companies are now beginning to place large purchase orders for two other equally empowering enhancements to cable systems:

- **Digital compression** — using part of a cable system's capacity to transmit video that has been digitized and then "compressed" — a much more efficient use of the pipeline; and
- **Fiber to neighborhoods** — extending the fiber beyond the main trunk lines and out into neighborhood "nodes" of 200 to 500 homes.

As cable companies carry out these two parallel processes over the next few years, they will be, in effect, transforming cable systems into high-speed digital transmission networks. Like fiber trunk lines, these future upgrades make business sense in their own right, helping cable companies provide more TV channels and clearer, more reliable video signals. But, once the cable network "goes digital," a whole variety of "Information Age" services will become possible.

Here are some further details on these upgrades, which will be the focus of cable industry construction during the rest of the decade.

Digital Compression

During 1991 and 1992, the cable industry discovered it could benefit from a new transmission approach called digital compression, which had been developed by competitors in the FCC's ongoing high definition television (HDTV) competition and by designers of early, unsuccessful direct broadcast satellite (DBS) systems.

Digital compression means replacing the traditional method of TV transmission — analog waves (which are continuous variations in current, akin to a dimmer switch on a dining room light) — in favor of digital transmission, a system in which a computer takes frequent numeric samples of the analog waves — the chandelier's brightness — and transmits this information

as a string of digital ones and zeroes. To transmit the massive information content of a TV picture, these digits are compressed, meaning much of their bulk is harmlessly discarded by mathematical processes to save space on the pipeline.

Cable engineers have devised a scheme for superimposing compressed, digitized channels onto the same fiber optic wire or coaxial cable that is also carrying conventional "analog" TV signals. Space savings in the pipeline can be dramatic: anywhere from 4 to 16 video channels can go into space that had carried one analog channel, depending on the subject matter and the required picture quality.

By late 1992, two U.S. cable companies, Tele-Communications, Inc. (TCI) and Viacom International, Inc., and Canada's Rogers Cablesystems, had all announced agreements to buy digital compression equipment, as had the Public Broadcasting Service (PBS) for the "education satellite" it plans to activate during 1994. TCI alone said it would spend $200 million on the compression upgrades. The cable industry hopes to recover this investment in channel expansion with new revenues from two sources:

- **Pay-per-view programs**, with the most in-demand movies beginning perhaps every 15 minutes, in competition with video cassette rental stores. Broadcasting with many convenient starting times has been called "**near video on demand**" to distinguish it from **true video on demand**, a system in which subscribers determine the exact start time of the program. Two recent market tests, in Queens, N.Y., and in a Denver suburb, both showed that a menu of "near-video-on-demand" programming satisfies almost all of viewers' demand for video entertainment — in other words, the huge extra expense of offering true video on demand would not yield commensurate revenues.

- **Niche-audience channels** providing special programming to narrowly targeted audiences. One plan is for an "Aviation Channel" targeted at 2.5 million real and would-be private pilots. The expectation is that these channels will be offered at low, a la carte prices (generally $1-$4 a month).

Subscribers may purchase these pay-per-view programs or a la carte channels either by sending signals upstream (on two-way systems) or by calling a phone number to activate a signal that is sent down to their cable converter's unique digital "address" to "descramble" the requested programming.

These compression upgrades are very cost-effective because the special converters that can decompress the digital signals need only be provided to subscribers who wish to buy the new services. Cable companies are talking to consumer electronics companies about the eventual inclusion of decompression and addressable descrambling capabilities inside future TVs and VCRs.

Transmission of programming from its point of origin to cable system headends also will be in a digitally compressed format, generally over satellites but alternatively over long-distance fiber-optic lines. In fact, compression of the "long-haul" portion of the delivery system is

already underway, with programmers like Home Box Office committed to switching over to compressed digital delivery in 1993. The 4 million U.S. owners of "backyard dishes" will also be offered decompression equipment so they won't be left out of the game.

Extending Fiber Optics to Neighborhoods

The extension of fiber optic lines to neighborhood "nodes" of 200-500 homes has occurred in a few cable systems and will spread widely in the coming years. Because it permits reduction of active electronic devices like amplifiers (as noted above), this extension of fiber, known as "fiber to the serving area" or "fiber to the node," dramatically increases the capacity of the final coaxial cable link into the home.

These two technological developments — digital compression and extension of fiber to neighborhoods — will create a growing abundance of video channel capacity and a rapid decline in delivery cost per channel. This trend has implications for those providing content of an educational or cultural nature. For instance, the entire content of the planned PBS 40-channel "education satellite" could possibly be made available at low cost not only to schools, libraries, etc. (which will receive the service on their own satellite dishes) but over cable to homes, as well.

Electronic Program Guides

How will subscribers know what to watch when there are hundreds of channels? Several major R&D projects (including one by InSight Telecast and another by a TCI subsidiary in partnership with *TV Guide* magazine) are developing on-screen electronic program guides capable of showing current and future program offerings. The viewer is able to "customize" these guides to display only the types of programming he or she wants, and the guides can even program a specially equipped VCR to record programs and keep an archival record of programs recorded.

With the aid of such software enhancements, the cable converter and remote control device are on their way to becoming a fairly sophisticated computer. It is no accident that Apple, Microsoft, IBM, and other computer companies are actively involved with the cable industry in designing future systems that will serve as the subscriber's window into this vast, and potentially confusing, abundance of programming.

Digital Switching and Routing

These capacity expansions as described so far (fiber optic upgrades and digital compression) have served only to enlarge the pipeline so that more content can be sent out to everyone in a "broadcast" or "point-to-multipoint" style of communication.

But a longer-term benefit of the digitization of program content will be the growing ability to switch or route content from a sender to a single receiver (known in telecommunications as "point-to-point" communication).

How it Works. All digital bits are essentially alike — whether they carry a movie, an opera, an electronic newspaper, or a phone call. A video program, once digitized, looks like any other digital data. In a computer network, data moves from one point to its intended destination(s) because it is tagged on the front with a small bundle of identifying digits known as a "header." Video programming is no different. Like any other data (CD-quality music, video games, or live video teleconferences), the digital data passes through switches that route it to its intended destination — either one or multiple recipients. Since the bundles of data are known as "packets" and the packets move through a network at very high speeds, this routing technique is known as "fast packet switching."

Just as PCs brought computer power from distant mainframes to the desktop (distributed computing), the trend in telecommunications is toward decentralizing the switching capability closer and closer to the end user (distributed switching).

The cable industry is designing a network that borrows from the latest distributed fast packet switching techniques developed for high-speed data communications. Cable companies are currently evaluating and testing different switching techniques, including Asynchronous Transfer Mode (ATM), a method which is fast gaining acceptance as a worldwide digital communications standard, and IBM's Packetized Automated Router Integrated Service (PARIS) packet-switching technique.

If 400 to 1,000 channels can be sent to a neighborhood of 300 homes, channel capacity becomes so great that individual channels can be sent to individual homes, or even individual viewers within that home -- a true video-on-demand capability. However, there are at least two reasons why most people in the cable industry expect that true video-on-demand will not be available any time soon:

- The necessary switching and routing equipment is still in the laboratories; and
- The smaller the audience size, the more unlikely it is that such targeting of video programming can be done profitably.

Hence, anyone promoting a system offering video on demand should be questioned closely as to its economics and technological availability.

Cable as a Data-Communications Carrier

Both CableLabs and individual cable companies are expanding their collaboration with computer companies aimed at transforming cable's networks into data communications pipelines. This emerging cable-computer industry collaboration is rapidly opening the cable industry up to many new and transformative ideas.

As part of its Ethernet on Cable project, Digital Equipment Corporation (DEC) needed only four days to turn a cable TV system in Hudson, Mass., into a conduit for transmitting high-speed Ethernet data signals (including computer files and two-way voice communication) so that hundreds of its employees could work at home, or "telecommute." (Ethernet is a widely used format for exchange of data over local-area and wide-area computer networks.)

Other implementations of high-speed, two-way data communications are running on cable systems in Cupertino, Castro Valley, and Milbrae, Calif., and in Portland, Ore.

TCI, the U.S.-based cable company which is the largest in the world, is working closely with DEC to develop video conferencing, telecommuting, medical imaging, high-speed data transport and other specialized services for health care and education.

TCI also is involved in a Defense Advanced Research Projects Agency (DARPA)-funded project with Hybrid Networks Inc. of Cupertino, Calif., which is linking the San Francisco area's regional cable interconnect into the Internet, a federally fostered computer network with more than eight million users, with the computer linkup set to "go live" in July 1993. This project could be the forerunner of a widespread interlinking of cable systems with the Internet and its planned successor, the National Research and Education Network (NREN), the latter designed to carry not only text and static graphics but also multimedia content.

Computer companies like Microsoft, Apple and IBM are eager to use cable's broadband pipeline to reach customers. Cable industry officials have told computer industry figures that cable would be willing to accelerate or alter its network development plans in response to the computer industry's multimedia agenda.

CableLabs is currently defining two sets of "protocols" (ground rules) for data communications over cable. The first is for relatively slow-speed, one-way communication, and will be put into use early in 1993 by providers of electronic program guides and other services. The second is a very high-speed, two-way protocol capable of transmitting many types of multimedia content.

Through use of the regional fiber optic networks described above, the cost of starting digital services (program guides, interactive distance learning courseware, etc.) can be shared regionwide or even nationwide by many cable systems. Then, as the service becomes more popular, its content will be moved to computers and mass-storage devices closer and closer to the subscriber.

The electronic publishing field is due for an explosion. For example, Apple and CNN have jointly developed a prototype of an "electronic magazine" with video-on-demand news segments. Knight-Ridder, Inc., has a prototype electronic newspaper. Both prototypes feature a versatile user interface that permits searching and cross-referencing that are impossible with their print counterparts. Cable companies want to be the carrier of choice for these and other services.

The cable industry's program guides will be an early multimedia implementation with simple video on demand. Creating such a system is thought to be a good investment because sales of movies and other programming will presumably be greatly enhanced when viewers can call up full-motion video previews of the programs.

At the far reaches of cable's digital transformation, cable's networks are even potentially usable for voice phone and videophone service. While technical and regulatory hurdles remain, cable companies could either operate a local-exchange phone service in competition with the existing telephone companies or make cable's network available to other companies, such as cellular-phone operators.

One type of phone service that cable companies are testing is the new type of wireless telephone system called personal communications services (PCS).

Another promising option is the wired systems being developed independently by First Pacific Networks, AT&T, and other companies. These systems support delivery of high-speed data communications and phone service (including videoteleconferencing) over cable systems.

III. Cable and its Competitors

Why is the cable industry so intent upon upgrading?

Quite simply, cable companies have to, in order to retain their customers in an increasingly competitive video marketplace. If they fail to upgrade, they will be challenged.

Non-Telco Competition to Cable

Cable already has strong competitors, with more on the way.

First, the rental and sale of movies through video stores was a $13 billion business in 1992. This compares with movie theater ticket sales (about $5 billion) and pay-cable TV (also about $5 billion). Americans obviously like the convenience, low cost, and "on-demand" nature of videotape movie going.

Second, as a result of rapidly evolving technology and the FCC's pro-competitive policies, cable faces competition from three new types of microwave transmission systems:

- There have been several premature attempts to create direct broadcast satellite (DBS) services, which have higher satellite power and cheaper receiving equipment than today's "backyard dishes." A new entrant, Hughes Communications' DirecTv service, is expected to begin offering 150 or more channels of DBS service in early 1994. Although DirecTv is targeted primarily at rural areas that cannot be served by cable, it could — with good programming — challenge cable in already wired areas.

- Two other competitors are multichannel, multipoint distribution services (MMDS), also known as "wireless cable," and a newer technology, local multipoint distribution service (LMDS), both of which are potentially capable of providing multichannel, cable-like service to urban areas.

The extent of the competitive challenge from these three "alphabet-soup" technologies mentioned is widely debated, but cable companies are taking it seriously.

The Telephone Companies

There is conflicting evidence, and much debate, about the appropriate role for telcos as a carrier of broadband (i.e., video and multimedia) services. The FCC's July 1992 "Video Dial Tone" ruling for the first time allowed telephone companies to distribute entertainment video programming.

The telco plant is currently serving quite well the market for voice and slow-speed data transmission for which it is well suited. Telcos sell a variety of high-speed lines to those large businesses that can afford them. For service to small businesses, telecommuters, students, etc., the capacity of the existing telco copper "twisted-pair" wires has been pushed to a point where modems available for $350 can transmit data at speeds (14,000 bits per second) that are 12 times faster than the standard data rate (1,200 bits per second) of just a few years ago.

In other words, the existing telco plant already can support services with text and limited graphics. Arguably, the modest amount of business now being done by electronic publishing, electronic mail and other modem-using services relates more to slow adoption, limited demand, and high prices than to inadequacies in the telcos' transmission systems.

Telcos' capacity problems. Should telcos attempt to deliver true broadband services to homes and small businesses, they quickly run up against the well-known capacity limitations of the copper "twisted pair."

After quite a few years of discussion among telcos and their vendors, telco strategists have come to realize that "fiber to the home" would probably cost hundreds of billions of dollars.

More recently, telcos have been focusing instead on a strategy of bringing fiber optic lines close to the house (or small business) — so-called "fiber in the loop" or "fiber to the curb."

Telcos' best research efforts on improving the capacity of the final copper-wire link have led to development of a technology, asymmetrical digital subscriber line (ADSL), which is capable of carrying only one or two low-resolution video channels over the copper wires.

Accordingly, two Regional Bell Operating Companies, U S West and Bell Atlantic, have recently announced their intent to build, on a trial basis, networks that bring fiber close to the home, then use coaxial cable for the final link into the home. The remarkable thing about these networks is that their architecture is very similar to the evolving architecture of cable systems!

Telcos also are studying wireless transmission methods, particularly the LMDS described above, as a way to drastically expand the size of their "pipeline" into the home and small business.

A recent analysis by CableLabs concluded that the "last mile" problem is only the tip of the iceberg for the telcos; the larger problem is that their entire network was engineered for short-duration, narrow-bandwidth voice calls. No matter what approach is employed to solve the "last mile" problem, the cost of upgrading other parts of the telco plant to carry video and multimedia content would be formidable, with few revenue streams in sight to help them recover the investment.

Telcos' incentives versus cable's. Should the telcos attempt to turn their network into a broadband (i.e., video and multimedia) transmission system, cable companies wonder whether the ensuing competition would take place on a level playing field.

Given the federal deficit and debt and the relative technological capabilities summarized in this paper, it is unlikely that upgrading the telephone plant will rank as a high-priority target for federal "infrastructure" investment.

Rather, cable companies' greatest concern is about the environment of rate-of-return regulation in which telcos operate — an environment in which their *guaranteed profits rise as they spend more money* operating their basic telephone business.

In addition, history gives cable companies reason to fear that upgrades of the telco plant will be paid for by cross-subsidization — i.e., with funding from telephone subscribers. Cross-subsidization, an activity in which telcos have engaged in the past, is difficult and expensive to regulate against.

Beyond outright investment, the threat remains of telcos' seeking preferential tax treatment, particularly accelerated depreciation of their copper-wire plant, in order to "make the numbers work" for a huge upgrade of the telco plant into a broadband network.

The cable industry's concerns would rise further should telcos use any of these means — federal money, rate-of-return economics, tax breaks, or cross-subsidies — essentially to duplicate cable's emerging fiber-coaxial broadband plant.

Demand for services should drive upgrades. The focus of the technological efforts of cable, telcos, and other carriers should be determined by what people want — by meeting definable, measurable needs.

Cable operators believe it would be folly, in a capital-intensive business like telecommunications, to undertake a large, redundant upgrade of the telco plant in hopes of inventing a market.

As outlined in earlier sections of this document, cable's cost-justified and evolutionary upgrade path, along with the expected arrival of new competitors such as DBS, will provide large capacity for video and multimedia services. Telcos already support voice, data and limited graphical communications. The only gap left for the telcos is for businesses of dubious viability like video-on-demand and multimedia. So far, these are not markets; they are technologies.

Thus, the rationale for a telco broadband upgrade would be along the lines of, "If we build it, they will come." But creating a second broadband delivery system will not in itself create demand for hypothetical, and largely still undefined, "Information Age" services.

A government effort to fund such a network could end up in the annals of oil shale, supersonic transport, and breeder reactors: all governmentally funded R&D efforts that ended up, as they say in the oil patch, as "dry holes."

IV. Independent Analysts' Comments

In a June 1990 RAND Corporation study, *Residential Broadband Services by Telephone Companies*, authors David P. Reed and Leland L. Johnson questioned the rationale for upgrading the telephone plant for switched video and other high-speed services.

The study contended that telcos, even if they were permitted to package and sell entertainment programming, could not compete successfully against existing cable companies without a strong demand for switched video, which the authors found lacking. Further, telephone network maintenance costs would rise and reliability could fall below current levels.

"Almost all imaginable information services to the home can be supplied by today's telephone and cable TV systems," the authors contended.

Perhaps the most complete and thoroughly validated study of these issues is found in David P. Reed's recent Carnegie Mellon University PhD thesis and book, *Residential Fiber Optic Networks* (Artech House, 1992). Reed, now a telecommunications policy analyst at the FCC, contends that:

- For the foreseeable future, it will be far less costly for the U.S. to retain two separate networks — a broadband cable network and a narrowband telephone plant — than to try to consolidate all desired functions into one network.

- Both telcos and cable companies would face high costs and poor revenue prospects should they attempt any time soon to offer switched broadband services, such as video on demand. Such networks, Reed notes "probably cannot be deployed economically over the next decade."

- "Fiber networks are expensive, and telephone companies need to demonstrate more clearly what new services these networks can deliver to the home that are not already, or soon to be, available to residential customers."

Even though he sees a long-term trend toward switched video networks, Reed cautions that mandating their implementation near term would be prohibitively expensive.

Further, he points out that because of the high cost of creating and operating an integrated broadband network, telcos would have difficulties competing against cable operators on the basis of lower costs. Then, the telcos would be tempted toward cross-subsidization and toward trying to buy cable systems in their service areas "to obtain programming expertise and establish a monopoly position in the transport of both narrowband and broadband signals."

V. Conclusion

Cable companies expect growing competition for the provision of video entertainment, and they know that their business will remain constrained and regulated in a variety of ways by Congress, the FCC, and municipalities.

But they hope that, over time, emerging competition, enhanced customer satisfaction, and upgrades in technology will earn them a gradual decrease of regulatory oversight.

Meanwhile, these new technologies offer cable companies huge opportunities. Cable's existing advantage, as noted, is that it has the only broadband network reaching almost all American homes today.

Aided by optical fiber, burgeoning computer power, data transmission, mass data storage, and digital switching, the cable industry intends to build a system that can deliver almost any imaginable service — entertainment, education, information, or communication — to nearly every American home.

Digital Compression and Transmission

By Craig K. Tanner, Vice President
Advanced Television Projects, CableLabs

For decades, cable television systems have provided dozens of channels of entertainment programming to North American homes. The world's broadest array of television services has grown with the support of this platform of very capable technology. In a few short years, though, we're likely to look back on today's purely analog cable systems as curious relics of the first age of cable.

Digital compression and digital transmission are coming to cable, and CableLabs is conducting research that will help make these technologies successful. This article will explain digital transmission and digital compression in conceptual terms for non-technical readers. It also will briefly describe the research being conducted at CableLabs by the Advanced Television Projects Department to help optimize the techniques employed for digital transmission over cable systems.

Analog Signals Defined

The signals that fill today's cable systems are analog signals. That is, they are time-continuous and amplitude-continuous. Stated another way, between established upper and lower limits, the transmitted signals can be of any strength, at any instant in time. Instant by instant, the precise level of the signal directly and proportionately creates the display on the screen, or the sound from the loudspeakers.

Therefore, to deliver high quality service to subscribers, today's cable system must be an extremely faithful carrier of these signals to the home. Very small disturbances to the signals that pass over a cable plant will result in immediate and visible flaws in the picture or sound. Cable system designers take great pains, and their owners spend great sums, to assure that transmitted signals are not distorted or interfered with in any way that might be visible. Unfortunately, these efforts are often less than completely successful.

Digital Signals by Contrast

Digital television signals are different. They are not continuous. Instead, they are time-discrete and amplitude-discrete. In other words, they are signals that are created so that they exist only at certain values at evenly spaced instants in time. Each value, or signal strength at a particular instant, represents a transmitted digit. Thus, a digital television signal is a string of digits metered out at an incredibly high rate. Binary digits are referred to, in shorthand notation, as "bits." Compressed television signal rates run from a few million bits per second for a digitized, compressed conventional NTSC television signal, to more than twenty million bits per second for a compressed HDTV signal.

The Digital Advantage

A cable system need not transmit each digit perfectly. As long as the subscriber's digital receiver or digital set-top terminal can differentiate one digit from the next, without misreading any digits, the string of bits arrives precisely as it was sent, and the receiver displays the picture and sound exactly as it left the programmer's uplink. This is no small accomplishment. In the entire history of the analog cable industry, no cable subscriber has ever received the full quality of the signal created at the source (this is true for broadcast television service as well, or any analog medium, for that matter).

Assuming that successful, error-free digital transmission can be achieved over the cable system, the determining factor in picture and sound quality will then depend only upon the method and quality with which the digital signal is created at the origination point. This is called "source encoding." If the resultant bit rates are very low, that is, if more than one digitized program can be transmitted in the frequency space (bandwidth) previously occupied by a single analog program, the source encoding is referred to as "compression."

Converting Analog to Digital

All television pictures and sound begin life as analog signals. Television cameras and microphones capture images and sound as continuous, analog electrical waveforms that mimic the real, continuously-varying image brightness and sound pressure that created them. (When you hear "analog," think "analogous").

To achieve the advantages of digital transmission, these analog signals must first be converted to digital signals. An analog-to-digital converter contains circuitry that measures the analog television signal's strength many millions of times per second, rounds each measurement, and outputs a string of digits representing the measured values. If the measurements are made frequently enough, and the rounding is carefully limited, the digitized signal is an excellent representation of the original signal.

Why Compression?

There is a problem, however. Converting an analog television signal to a digital one in this simple fashion results in an enormous quantity of digits. More,

in fact, than can be successfully sent down a standard cable channel. In fact, a current (NTSC) television signal which is converted to digital using the brute force technique described above would require perhaps six conventional cable channels to transmit. (On an average 54-channel cable system, only nine (54 divided by 6) program services could be provided. Clearly not a step forward!)

This is where digital compression comes in. Another term for compression is bit-rate reduction. The challenge is to reduce the number of bits per second needed to transmit a high quality video and audio signal. Although the implementation can be quite complex, the basic concepts are simple.

Compressing the Video

First recall that television pictures are a perceptual trick. What the viewer perceives as motion is really a series of still pictures, or "frames," that are displayed at a rate of 30 per second. Such television signals have substantial redundancy in them. That is, one frame looks much like the next, in most cases.

For example, a still television image displayed on your screen for a few seconds (a cable network's logo, for instance) is a sequence of absolutely identical pictures transmitted 30 times per second. Imagine the savings in transmitted bit rate if only the first frame were transmitted, with the receiver displaying subsequent frames by repeatedly displaying this first image by retrieving it from a memory (a "frame store") located in its circuitry. This concept is at the core of video compression techniques, and it is called eliminating temporal (time-oriented) redundancy. Roughly translated, the rule is, "Don't transmit picture elements you've already sent if they can be used again."

Obviously, if a scene contains motion, succeeding frames are not identical, and things are not so simple as repeating a previously stored frame. But even with motion in a scene, many of the elements of the image remain similar from frame to frame, although they will have shifted in position. Intelligent circuitry in a compression encoder can analyze the motion in a frame, and predict fairly accurately where objects will appear in the next frame (this is "motion estimation"). A few simple commands sent to the receiver (these are "motion vectors") can tell its circuitry how to rearrange the elements of the previous frame's image, which has already been stored in the frame store, to best approximate and display the next frame.

Since rearranging a previous frame never results in a perfect estimate of the next frame, there must be a mechanism for correcting the small errors made. Additional "cleanup" bits are sent to make the necessary corrections (this is called the "error signal"). To send the motion vectors and the error signals requires, in total, far fewer bits per second than transmitting the full digitized signal.

In fact, the "error signal" bits are themselves compressed by applying a mathematical transform (the "discrete cosine transform", or DCT) and then rounding ("quantizing") the results. The DCT achieves compression by using a mathematical function to describe entire areas ("blocks") of the error signal, which is more efficient than transmitting each picture element individually. It is particularly useful for pictures with broad, flat areas of uniform brightness and color or regular texture. Transmitting a few simple DCT coefficients allows the receiver to reverse the mathematical transformation and reproduce an entire area of the error signal with high accuracy. This is known as eliminating spatial redundancy, as opposed to the temporal redundancy described earlier. (The term spatial means over space, or across the surface of the picture, as opposed to over time, which means between successive frames.)

Eliminating temporal and spatial redundancy in television imagery are the two major techniques that allow compression of digital television pictures.

Through the combination of all of these techniques (and a few more), 100 millions bits per second can be reduced by a ratio of 20 to 1, or even more. The greater the bit rate reduction, of course, the greater the danger that the reconstituted picture at the receiver/decompressor will have some visible flaws.

Compressing the Audio

The audio signal is compressed with different techniques. There are no frames in audio signals, and thus no temporal redundancy. However, because of limitations in human hearing, there are elements to an audio signal that can be deleted from the signal, or sent in a simpler, quantized (rounded) fashion, while maintaining subjective quality that compares well to that of a compact disc. This is the general concept followed in audio compression.

How Much Compression?

An uncompressed, digitized NTSC video signal which requires 100 million bits per second to transmit can be reduced in bit rate, or compressed, to perhaps 3 to 5 million bits per second, and still be of excellent quality. This is actually a lower bit rate than is needed to fit the digital television signal into a single cable channel. In fact, four to six such digitally compressed signals can be carried where one analog signal is now carried. At lower bit rates, even more signals can be transmitted.

From this startling achievement will spring a multi-billion dollar growth phase for the cable industry. Pay-per-view programming will soon be allotted dozens of channels, instead of just two or three. Start times for movies will come every few minutes, instead of twice an evening, and cable pay-per-view services will rival the video tape rental for convenience. Picture and sound quality will be uniformly excellent. Buy rates will soar.

Does Digital Transmission Require a Rebuild?

If cable networks carry analog signals now, do we need to rebuild them to carry digital signals? The answer is "no." All we need do is to create source signals at the headend (or receive them from a digital satellite feed) that are organized as a series of digits (actually, a series of pulses, or bursts of radio frequency energy), with a finite set of values, rather than the

continuous (analog) signals we transmit now.

These digital signals will travel quite well over today's cable systems. The higher the quality of the cable system, though, the more bits per second can be transmitted. Cable systems that introduce impairments such as noise, interference, distortion or ghosting tend to "scramble" trains of digital signals at very high bit rates, preventing their correct reception at the consumer's home. CableLabs is conducting research to find out how to minimize the occurrence of these problems. More on that later.

The Scenario for Digital Cable

All in all, cable systems are well suited for digital transmission, but because there are nearly 180 million analog television receivers in the U.S. alone, no cable system will convert overnight to all-digital signals. Existing televisions and VCRs will need to be served with conventional analog signals for years to come, so cable operators will continue to carry their current analog television signals. New, digitally-modulated signals will be added at the highest frequency (upper) channels in the system. This is how cable systems will grow as system bandwidths are upgraded. Thus, cable systems, beginning in about 1994, will be transformed to "hybrid" analog-digital systems.

Our Research

The Advanced Television Projects Department at CableLabs is currently conducting research to characterize the transmission quality of existing cable systems, with particular attention to the impairments that can cause trouble for digital signals. Many cable systems will be measured, at many homes, to yield a statistically significant sample of the channel characteristics with which digital cable equipment will have to cope.

These channel characterization measurements will be given to vendors developing NTSC compression systems and digital HDTV systems. This body of data will allow manufacturers to design products that will achieve successful digital transmission on virtually all cable systems, while providing them the confidence to avoid over-designing products that would be unnecessarily costly to cable operators and consumers acquiring digital equipment. The studies also will develop recommendations for cable operators who will implement digital transmission on their systems.

The Years Ahead

With the era of digital signals upon us, cable systems can be accurately viewed, in a technical sense, as being in their infancy. If the technical capabilities of our networks are just beginning to be fully realized, the business prospects are sure to develop in exciting ways as well. We're looking forward to supporting our member companies' growth in this exciting period ahead.

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A BRIEF OVERVIEW OF TRENDS IN THE APPLICATION OF TELECOMMUNICATIONS TECHNOLOGY

TELEMEDICINE OVERVIEW

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TELEMEDICINE OVERVIEW

This information represents three levels of telemedicine application of today's technology. Although we know this is not all inclusive, we hope to provide you with limited information regarding today's technology as it applies to telemedicine services.

VIRTUAL MEDICAL CENTER

The Virtual Medical Center is a computer bulletin board system for health professionals. The VMC can be accessed by any health professional using any computer and modem to obtain clinical information, library services, consultation and continuing education.

MONTANA MEDICAL INFORMATION NETWORK

The following pages explain the Montana Medical Information Network. This network is used for sending and receiving messages (Text, images, and clinical graphics) and is a complete "desk top" computer system capable of running thousands of software programs.

EASTERN MONTANA TELEMEDICINE PROJECT

The final pages of this telemedicine document explain the Eastern Montana Telemedicine Project. This network provides two-way interactive, videoconferencing technology to the delivery of specialist medical and mental health care services, continuing medical education, and community development to rural communities in eastern Montana. The project hub consists of Deaconess Medical Center and all of Billings based specialist physicians. The rural communities are medical and mental health care facilities in Miles City, Glendive, Sidney and Culbertson, Montana.

Montana
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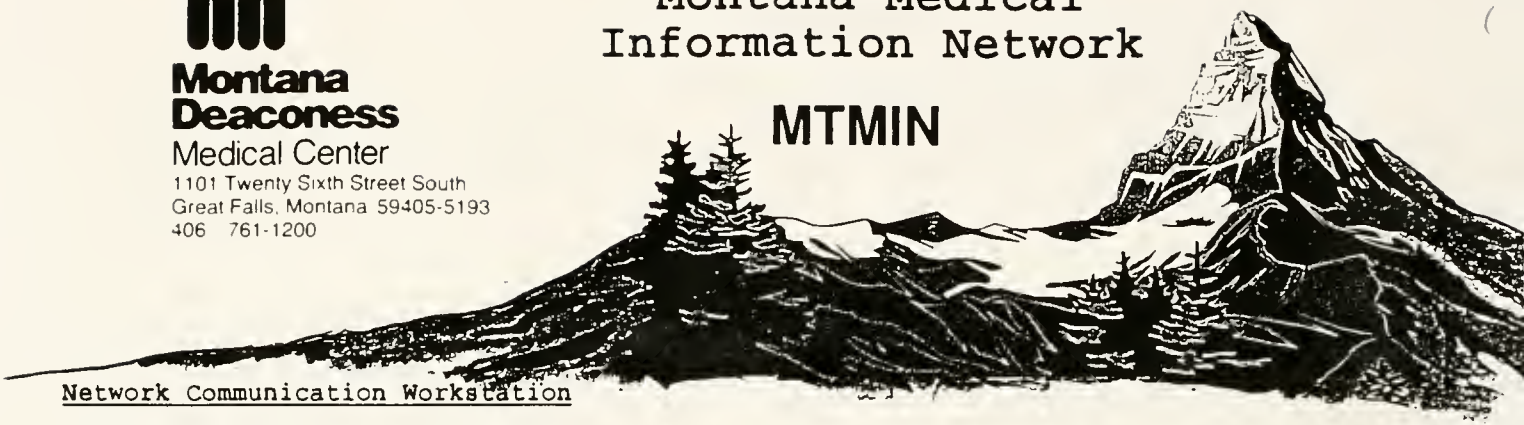
Great Falls, Montana 59405-5193
406 761-1200

Montana Medical Information Network

MTMIN



Network Communication Workstation

A Network Communication Workstation (NCW) used for sending and receiving messages (Text, images, and clinical graphics is a complete "desk top' computer capable of running thousands of software programs. It must be an IBM or compatible personal computer (PC) with certain required peripherals. Network participants may be able to utilize an existing PC or obtain one from a vendor of their choice.

Using An Existing PC as an NCW

If an existing PC fits the following specifications it will likely be compatible for use in receiving and sending text messages barring rare conflicts with your present software. MTMIN personnel will assist in testing the PC at your site for compatibility.

NCW Minimum Hardware Specifications

A PC must have the following characteristics for minimum Network compatibility:

- CPU: True IBM PC/XT/AT compatible or IBM PS/2 series.
- Main Memory: 640kb minimum
- Hard Drive: At least 10mb of free space.
- Monitor: Ideally a VGA color monitor and a video card with 512kb DRAM or VRAM and Tseng Labs ET3000/4000 chip set works the best for Medical Images, Clinical Graphics, CME, and normal text processing. Older monitors and video cards (Monochrome, CGA, EGA) only support text.
- Printer: Epson compatible dot matrix and laser printers work the best. Others may require testing. Daisy Wheel printers are incompatible.
- Modem: True Hayes compatible modems 2400 baud and higher. Medical Image transmissions require Hayes compatible 9600 baud modems and higher.

The NCW is ideally connected to the Medical Information Network by a dedicated phone line enabling the network participant to receive messages 24 hours a day. However, a telephone line sharing device (ASAP TF555 suggested) will allow you to use your FAX, Phone, & Modem on one existing phone line. This configuration works best when the phone is not used very often.

Software, Training, and Support

In addition to the Network Communications software the participant will have free access and training in Synergy Series Software. This package includes integrated practice support software for word processing, data base management of patient recall, drug therapy data base with prescription writing capabilities and accredited CME case studies.

Call the Medical Information Services Director at (406) 455-5044 for any further questions.

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Information Edge!

Uses of interACT!™

Handle your essential business communication tasks with this one program. You will realize the power which results from uniting Computers and Communications! At Last! Dial-Up Teleconferencing is Affordable!!! ...for meetings, teleteaching, and customer contact. Avoid travel expense and hassle. Show photographic information at a distance. Interactively...share charts, graphs, and CAD drawings. interACT!™ imports screens from other application software. Cut phone bills for lengthy messages. Includes keyboard message transfer and easy communication of DOS files. Takes multimedia beyond local presentation. interACT!™ is used locally and remotely via dial-up modem for video, graphics, and text.

System Requirements

Software: DOS 3.1 *(or higher)*
Hardware: IBM AT Class PC or compatible, 640K RAM, a hard disk, VGA, or Extended VGA *(640X480X256 colors)*, and a modem. An open serial port for mouse or pen/tablet is recommended.

Pointer and Annotation

- Pointer moves simultaneously at all links, in real time;
- Annotation on top of images at all ends;
- Annotation occurs in real time acting as an electronic black board;
- Multi-color writing;
- Pre-defined fonts for perfect text annotation;
- Many line widths to fit specific drawing needs;
- Boxes, Circles, Lines, Filled Objects, Floods, and Image Cropping;
- Zoom and Shrink functions;
- Color editing functions - palette routines

Image Libraries

- Store and retrieve images from previous sessions;
- Annotation(s) stored with Image(s);
- Up to 1,000 images can be stored on an ordinary 40MB hard disk.

Folders
(Groups of Images)

- Folders can be retrieved, received, and reviewed;
- Folders provide for distance presentation of video, text, and graphics
- Create a folder, add, delete, or sequence pages.
- Mix pages of different video resolution in one folder;
- Mix color, grayscale, and black/white pages in one folder;
- Folders can be set to automatically "play back" with no peer intervention;
- Folders/Pages can be sent during an on-line session;
- Folders/Pages can be sent overnight, unattended, when telephone toll charges are minimal

Printer Support

- Most color and black/white laser and dot matrix printers are supported.

Transmission

- Standard dial-up telephone lines;
- Supports all modem types and baud rates;
- Send/Receive DOS files (compressed);
- Send/Receive interACT!™ folders, pages, pointers, and annotations

Video

- Up to 640X480 screen resolution with 256 colors;
- Video inputs from: color camera (still frame), scanner, video cassette recorder (VCR), image libraries, image folders, GIF, PCX, or TGA graphic files;
- Import from other popular software programs - export to common graphic file formats

Clipboard

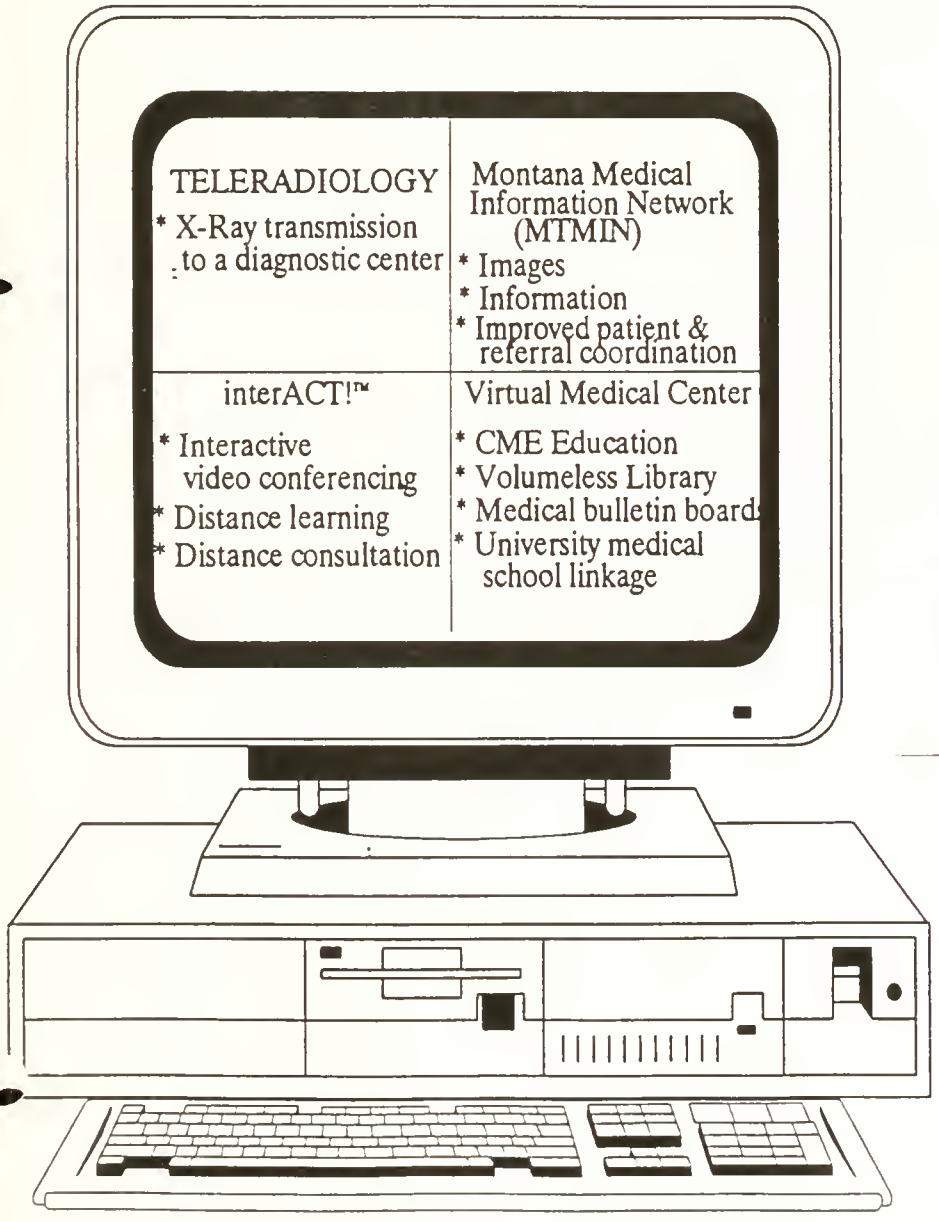
- Copy sections of an image to the clipboard;
- Paste the contents of the clipboard into the image you are viewing

Session Helpers

- Pre-send Presentation Material;
- A record of the session is stored and accessible at any time;
- Images libraries are accessible at all times;
- "Bookmark" recovers session in the event of a power failure - on-line HELP!

Kirk G. Wilson, President/CEO
Montana Deaconess Medical Center

REACH MONTANA: A Consortium of Region II Hospitals bringing telemedicine to rural patients



= TELEMEDICINE

Standard phone lines delivering a viable means of reducing costs while improving quality.

Montana Deaconess Medical Center

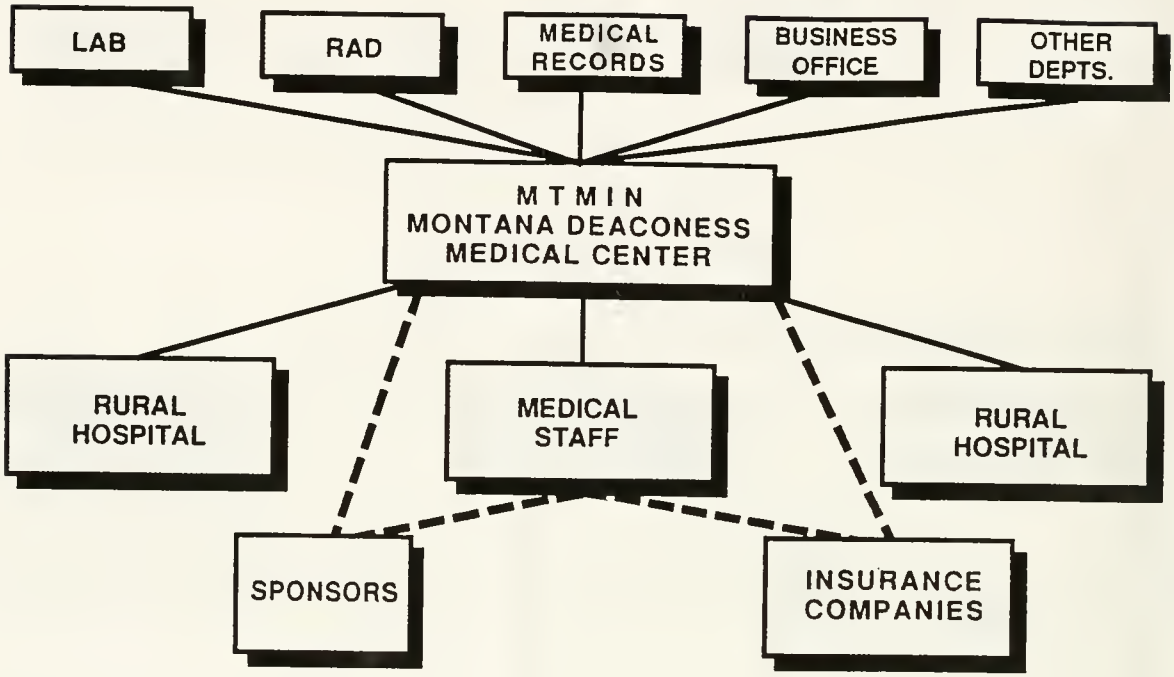
Craig E. Hepp
Director

Medical Information Services
1101 Twenty Sixth Street South
Great Falls, Montana 59405-5193
406 455-5044
406 455-4998 (Fax)

Excellence with a personal touch

Montana Medical Information Network (MTMIN)

at Montana Deaconess Medical Center



- Improve service to patients
- Improve service to physicians
- Improve referral relationships
- Improve use of human resources

Montana Deaconess Medical Center

Components of Physician Communication

The accurate and timely communication of clinical, financial and administrative patient data optimizes quality care, service

Hospitals
- Medical Records
- Results Reporting
- Discharge Summaries
- Electronic Signatures

Managed Care/Payors
- HMO/PPO
  - Eligibility
  - Referral Authorizations
  - Encounter Forms
  - Electronic Provider Directory

MTMIN

Billing Management Systems

Radiology and Imaging Centers

Pharmacies

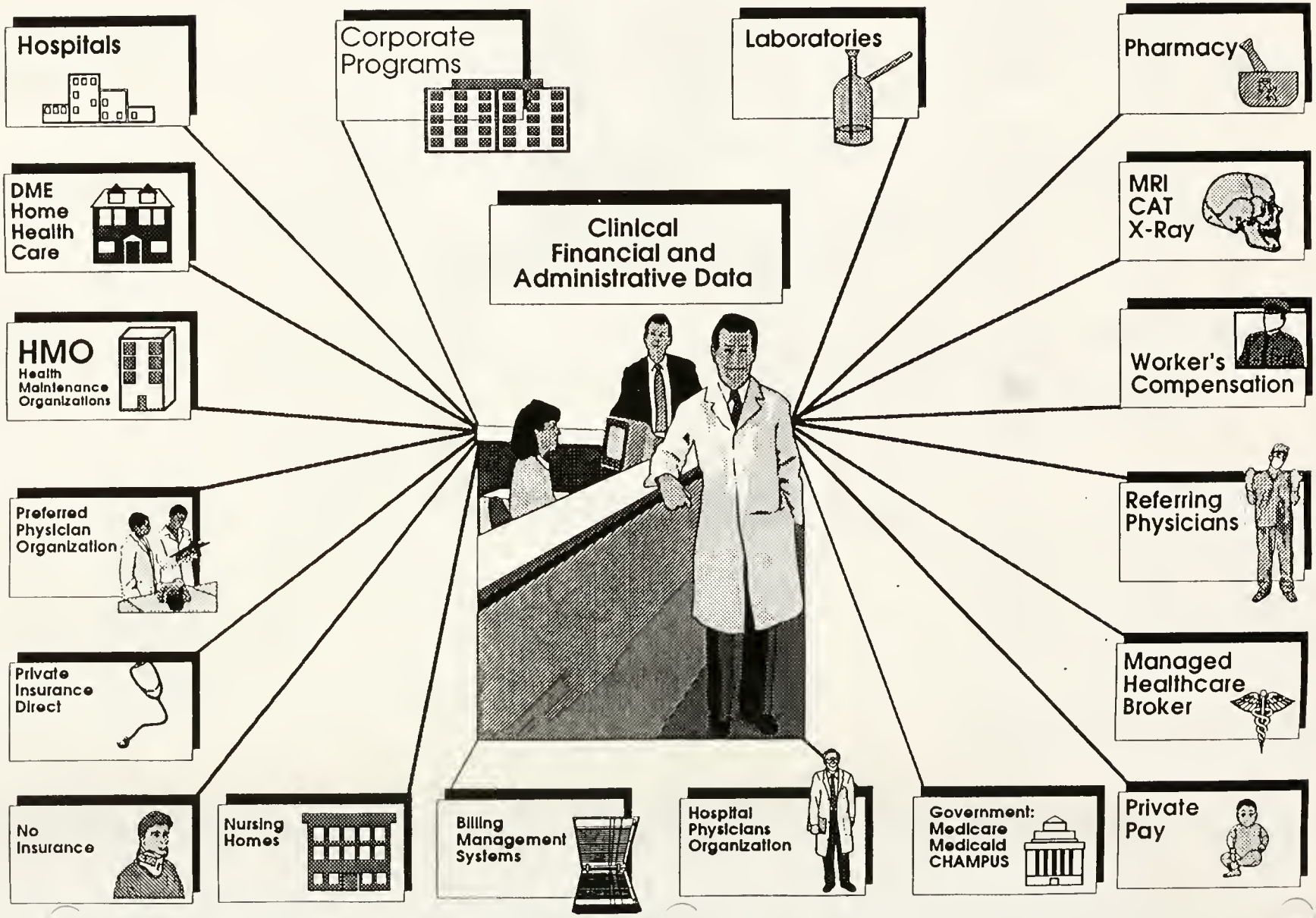
Referring Physicians

Professional Organizations

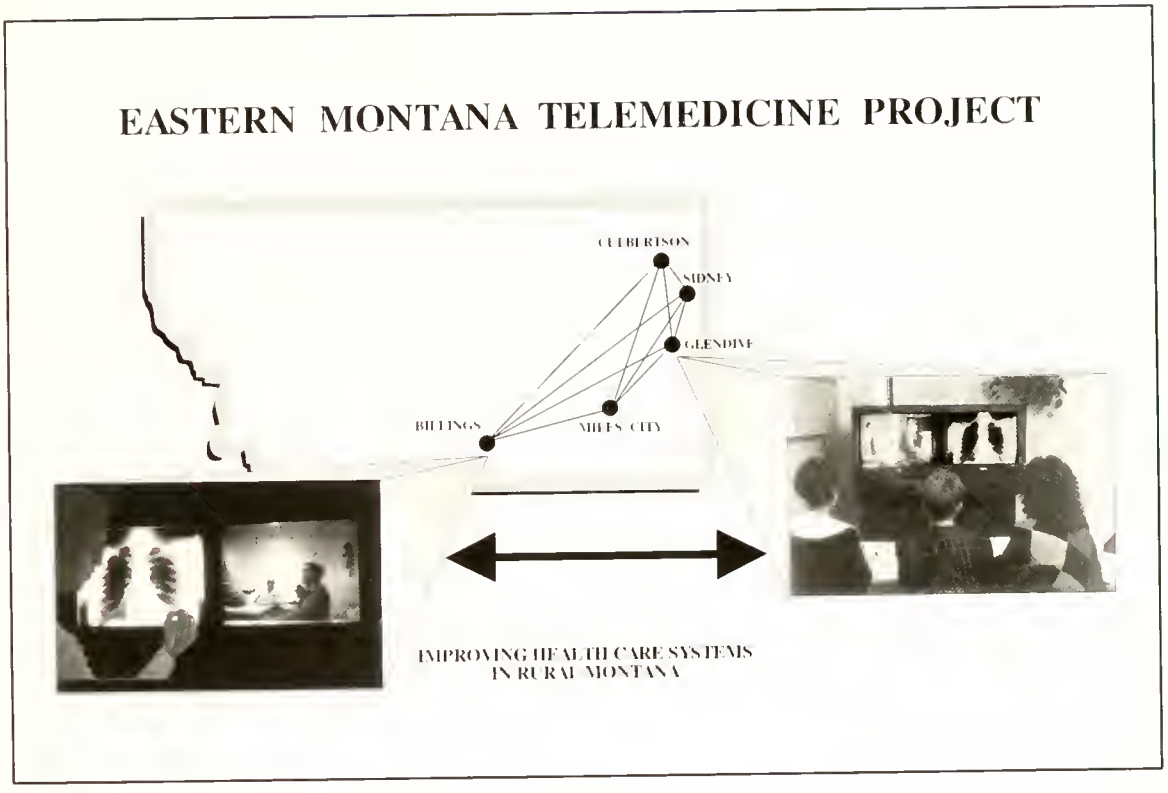
Clinical Laboratories
- Lab Reports
- Transmit Lab Requisitions

Montana Medical Information Network

The Healthcare System



TELEMEDICINE: Health Care From A Distance



"It has been said that communication and technology are as important to the health care system as the scalpel and the stethoscope."

Mary Gardiner Jones, Consumer Interest Research Institute

Eastern Montana Telemedicine Project Program Office
2800 Tenth Avenue North
Billings, Montana 59107
(406) 657-4870

TELECOMMUNICATIONS — PUTTING THE PIECES TOGETHER

Modern telecommunications technology has empowered America with the ability to deliver new and enhanced communications services. Unimaginable only a decade or two ago, sophisticated voice, data, video, and graphic transmissions could be the norm as we move into the 21st century. Not to be left behind, the medical industry is rapidly pursuing the medical application of telecommunications, **telemedicine.** With the increased information carrying capacity of telecommunications lines and equipment, quality voice and video transmissions can provide medical and mental health consults and enhanced educational opportunities in the health care field.

What is the Eastern Montana Telemedicine Project?

The Eastern Montana Telemedicine Project will demonstrate the application of two-way interactive videoconferencing technology to the delivery of specialist medical and mental health care services, continuing medical education, and community development in rural communities of eastern Montana. This is a collaborative effort between Deaconess Medical Center in Billings, Holy Rosary Hospital in Miles City, Eastern Montana Community Mental Health Center in Miles City, Glendive Medical Center, Community Memorial Hospital in Sidney and Roosevelt Memorial Hospital and Nursing Home in Culbertson.

What is Telemedicine?

Telemedicine is a system of health care delivery in which physicians examine patients at a distant location through the use of telecommunications technology. The term "telemedicine" is derived from the Greek "tele", meaning at a distance, and from the Latin "medri" meaning healing.

Telemedicine helps people in rural communities with limited health care facilities to have easy access to highly trained medical specialists. Telemedicine also allows special populations, such as those in institutions, to receive medical diagnosis and care when travel is not always possible. Travel is typically wasted time for physicians. This loss of valuable time, expertise and dollars, as well as pain and prolonged dysfunction for the patient can be eliminated through telemedicine.

How will Telemedicine affect Montana?

Montana is a vast state comprised primarily of rural communities. The service area of the Eastern Montana Telemedicine Project consists of 11 counties which either surround or are served by the participating rural facilities. The communities participating in the Eastern Montana Telemedicine Project represent four levels of care. Culbertson does not have a hospital but instead a Medical Assistance Facility. A MAF is a maximum six bed, limited inpatient stay facility currently operating under a demonstration grant from the Health Care Financing Administration. This appears to be a successful alternative model for the smallest rural communities that cannot support a hospital. Glendive Medical Center is a primary care facility. Sidney and Miles City have secondary medical care facilities providing limited specialist physician services. Deaconess Medical Center is a regional tertiary care institution.

Telemedicine is effective because it allows a patient, a primary physician and a consulting specialist to see and talk to each other through interactive two-way communication. Physicians can conduct a clinical examination of a patient across great distances and medical professionals can deliver their expertise where it's needed and when it's needed regardless of geography.

Is there a need for Telemedicine in Rural Montana?

One of the most pressing problems in health care today is providing access to quality health care to men, women, and children in remote or outlying areas where limited medical care exists. Another pressing issue is how to deliver expert care cost effectively. Additionally, there is a great need for health care providers in rural Montana to access continuing education programs required to maintain their licenses. Pharmacists, hospital and nursing home administrators, other allied health personnel and emergency medical personnel are required to gain regular continuing education credits. In most instances these are not available in rural communities and providers must travel to larger cities to attend these courses. Telemedicine may be the single most important technology that can effectively address all of these health care issues.

How is Telemedicine possible?

Telemedicine is made possible by using compressed digital video interactive technology and does not use ordinary phone lines for its transmissions. Such phone lines transmit signals too slowly to deliver the clear image essential to diagnostic accuracy in distance evaluations.

Digital data is transmitted swiftly through fiber optics, satellites, laser beams, conditioned copper phone lines or microwaves and delivers a clear, vibrant, crisp picture. This is precisely the kind of transmission that makes telemedicine as easy as a face-to-face conversation between a patient and a physician, or a physician and a colleague. The Eastern Montana Telemedicine Project is operating a compressed video system which is transmitted over a dedicated network of copper and fiber optic phone lines.

How will Telemedicine services be used?

The delivery of medical, mental health and health care educational services to rural communities has never been easy. With the vast growth that health care technology has seen in recent years, the challenge has become even greater. The Eastern Montana Telemedicine Project proposes to use telemedicine services to provide access to the most current diagnostic tools available. Telemedicine will provide direct delivery of patient care during scheduled specialist telemedicine clinics. Additionally, consultations can be provided upon request by rural primary care health professionals, including medical, surgical and psychiatric specialties. Telemedicine will help provide routine and emergency x-ray interpretation, and consultative interpretation of pathology slides. These are just a few ways in which this technology can enhance the delivery of health care to rural Montanans, while maintaining patient care in the home community.

The telemedicine project can also provide medical education and training programs for rural physicians and other medical and mental health care personnel using the same telemedicine systems and network. It will allow participants to access classes, seminars, and courses that otherwise might not be available. Eastern Montana College in Billings will conduct upper division courses over the telemedicine network into the eastern Montana communities served. Other avenues are being explored to further enhance the potential educational opportunities this project could offer the communities it serves.

How are Telemedicine and Economic Development related?

With advanced telecommunications technology, businesses are no longer restricted to large metropolitan areas, but rather they can move into rural communities where there is a reliable workforce, lower cost of living and numerous other advantages. For rural Montana, telecommunications can create new employment opportunities and help small rural communities attract new business. This influx of business opportunity has already begun in some small communities and it has strengthened and diversified the economy. Telecommunications has the potential to strengthen the local economy and improve the standard of living which will keep people from moving away in search of work.

What other communities will benefit from Telemedicine?

While the immediate intent of this project is to establish a six site network within eastern Montana, it is conceivable that the Eastern Montana Telemedicine Project could grow to include many more communities in Montana. This project could also be linked with the few other telemedicine networks across the country. Because Montana has neither a medical school nor residency program, there is great potential to benefit from links with telemedicine programs such as the Mayo Clinic, the University of Kansas Medical Center, and the Medical College of Georgia.

Who can I call for more information?

You can call any of the participating sites on the Eastern Montana Telemedicine Project. The program office is at Deaconess Medical Center, (406) 657-4870. Other participating sites include Holy Rosary Hospital in Miles City, (406) 232-2540; Eastern Montana Community Mental Health Center in Miles City, (406) 232-0234; Glendive Medical Center in Glendive, (406) 365-3306; Community Memorial Hospital in Sidney, (406) 482-2120; and Roosevelt Memorial Hospital and Nursing Home in Culbertson, (406) 787-6281.